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DATA BASE DEVELOPMENT FOR AIR FORCE SATELLITES,(U)

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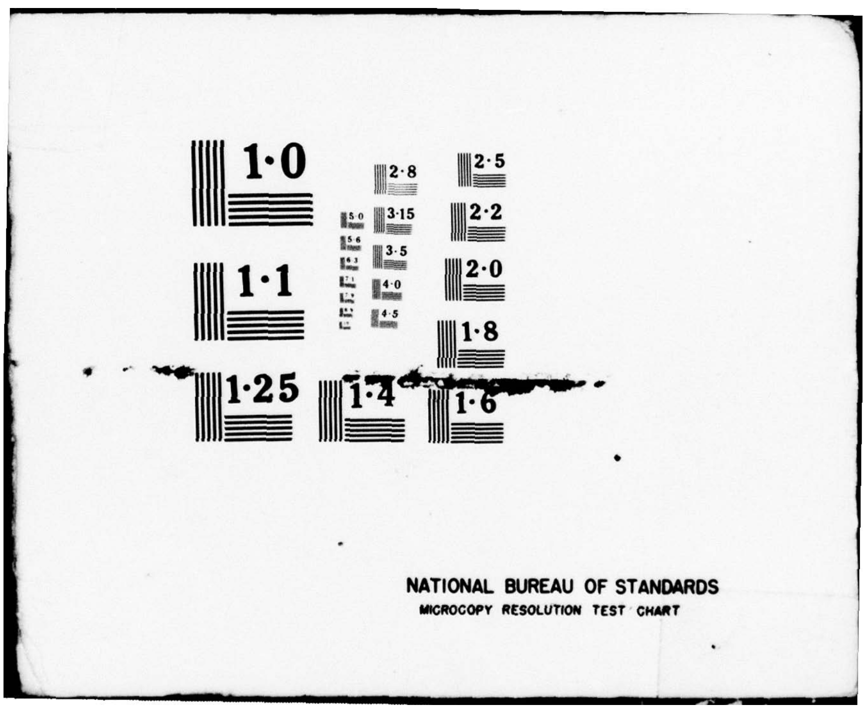
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DATA BASE DEVELOPMENT FOR AIR FORCE SATELLITES

Dennis E. Delorey

SPACE DATE ANALYSIS LABORATORY
BOSTON COLLEGE
Chestnut Hill, Massachusetts 02167

SCIENTIFIC REPORT NO. 2
31 March 1978

Approved for public release; distribution unlimited

Prepared for

Air Force Geophysics Laboratory
Air Force Systems Command
United States Air Force
Hanscom AFB, Massachusetts 01731

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18 19 **REPORT DOCUMENTATION PAGE**

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: AFGL-TR-78-0076	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): 6 DATA BASE DEVELOPMENT FOR AIR FORCE SATELLITES	5. TYPE OF REPORT & PERIOD COVERED: Scientific Report No. 2
	6. PERFORMING ORG. REPORT NUMBER: 14 BC-SDAL-78-1 SCIENTIFIC-2
7. AUTHOR(s): 10 Dennis E. Delorey	8. CONTRACT OR GRANT NUMBER(s): 15 F19628-76-C-0190
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Trustees of Boston College, Chestnut Hill, Massachusetts 02167, Monitor/Robert McInerney/SUA	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: P, T&WU No. n/a
11. CONTROLLING OFFICE NAME AND ADDRESS: Air Force Geophysics Laboratory, Hanscom AFB, Massachusetts 01731, Contract Monitor: Mr. Robert McInerney/SUA	12. REPORT DATE: 11 31 March 1978
	13. NUMBER OF PAGES: 73
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

12 74p.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Air Force Satellites, Data Analysis, Data Bases, Data Processing, Data Processing Systems, Satellite Data, S3 Satellite Data, SCATHA Satellite

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Data bases have been created for the S3-1 satellite and are being created for satellite S3-2. The data processing system developed for these vehicles, the payloads aboard the spacecrafts and the computer software associated with the data processing system are described. Creation and application of the history file for satellite S3-1 are also described. An overview of the SCATHA satellite project is also included.

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PREFACE

The author wishes to thank several members of the Space Data Analysis Laboratory for their efforts in relation to the tasks described in this report. Administrative assistance was provided by the Director of the laboratory, Mr. Leo F. Power, Jr. The analysis efforts of Mr. Paul N. Pruneau were, once again, commendable. Additional analysis support, programming and data base efforts were provided by Ms. Carolyn M. Parsons, Mr. Roger P. Vancour, Jr., Mr. Brian J. Donovan, Ms. Lisa Silva, Mr. Kenneth Dieter, Mr. Timothy Latson, Mr. Neil J. Grossbard and Mr. Brian F. Sullivan.

A special thanks goes to the Contract Monitor, Mr. Robert E. McInerney, for his assistance during the period covered by this report.

Also, thanks go to Ms. Mary Kelly for her typing and proofreading of this report.

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1.0 INTRODUCTION

The Space Data Analysis Laboratory (SDAL) of Boston College has been contracted by the Analysis and Simulation Branch (SUA) of the Air Force Geophysics Laboratory (AFGL) to develop mathematical and computer techniques necessary for the analysis of digital information from payloads flown aboard Air Force Satellites. The data analysis efforts require an integrated and systematic approach in order to incorporate the mathematical procedures associated with individual payloads while taking into account vehicle attitude and ephemeris parameters.

The prime efforts during the period covered by this report were associated with Satellites S3-1, S3-2, S3-3 and the SCATHA program.

In order to satisfy data analysis requirements, a data processing system (DPS) was developed and implemented for satellite S3-1. This system was adapted for use with the S3-2 and S3-3 vehicles. The system will be modified and adapted in order to satisfy requirements associated with the SCATHA program.

The S3-1 effort involved the creation of the final geophysical data bases for a Cold Cathode Ionization Density Gauge (IDG), the Miniature Electrostatic Accelerometer (MESA) and two mass spectrometers (MSI and MSIV). This effort entailed the completion of standard processing and the processing of data from problem orbits. Efforts were also expended on the selective processing of data from the Piezoelectric Accelerometer and from another ion density gauge. In addition, data compaction aimed toward the creation of a unified history file for this vehicle was of importance. Analysis efforts were involved in the development of software to integrate the appropriate data bases and produce history displays of selected parameters.

The S3-2 efforts dealt with the following experiments: Electrostatic Analyzer, Fluxgate Magnetometer, Piezoelectric Accelerometer, Cold Cathode Ionization Density Gauge and the MSIV mass spectrometer. The main emphasis was placed on the development of analysis to be used in the systematic processing of the data and the translation of the analysis into efficient computer software. Selected data has been processed for the probes mentioned. Creation and maintenance of the raw data files, the B&L files (magnetic and ephemeris data), Geophysical Support Files (neutral atmospheric model data)

and output module (OM) files (coefficients necessary for the computation of vehicle attitude) was an on-going effort.

For satellite S3-3, the principal responsibility of the SDAL lies in the development of the compacted raw data bases for the AFGL probes and the creation and maintenance of the B&L and OM files.

For the SCATHA project which is part of an Air Force program to investigate spacecraft charging at high altitudes, preliminary investigations were conducted into data analysis requirements in order to begin the adaptation of the S3 DPS for the SCATHA effort.

2.0 S3 SATELLITES

2.1 Vehicle Operations and Spacecraft Telemetry

The S3-1, S3-2 and S3-3 satellites were made of the same basic structural frame and the telemetry systems for all three vehicles were identical. Spacecraft operations for the three vehicles were, however, different.

The AFGL probes flown aboard the S3-1 vehicle were operated primarily during the perigee portion of orbits. This data was, in general, tape recorded and played back to Satellite Control Facility (SCF) remote tracking stations (RTS). Other operational modes allowed for the acquisition of full orbit and real time data but the perigee data was considered to be prime. For normal operations, data was recorded on every other orbit although increased coverage was obtained during periods of special interest, e.g., geomagnetic storms. Data from this vehicle was transmitted through approximately 2700 orbits.

The S3-2 spacecraft is still operational and has exceeded 10,000 orbits. The AFGL probes aboard the vehicle were categorized into two classes labeled Group I and Group II. The group I payloads were designed primarily for high latitude studies. The group II experiments were similar to probes flown aboard satellite S3-1 and, thus, the prime data was that of the perigee region. Vehicle operations allowed for the tape recording and playback of data from group I only, group II only or shared orbits in which data was acquired from both the group I and group II payloads. Real time acquisitions were also available for this vehicle.

The S3-3 satellite which is still operational obtains data over a longer orbital period than either of the other two S3 vehicles. The prime data for this vehicle is tape recorded and played back to SCF RTS. Real time data is also available for this vehicle.

As previously mentioned, the telemetry system used for all three vehicles was identical.

The satellite pulse code modulation (PCM) ata is telemetered to SCF remote tracking stations by Bi-Ø-L modulation of the carrier. The PCM data is transmitted at two data rates. Real time data is telemetered at 16,384 bits per second (bps). Tape recorder playbacks occur at 131,072 bps. Thus, the tape recorder playback to real time transmittal ratio is 8 to 1. Real time PCM data is transmitted by phase modulation in the reverse order from the real time data transmissions.

The satellite PCM systems consist of a 128 word main frame. Each data word is composed of eight bits and thus each main frame consists of 1,024 bits. Data is read out at a rate of 16 main frames per second with each main frame containing 24 subcom frames (sc) and five sub-subcom frames (ssc) in the sub frames. Thus a master frame (one read out from each word occurs over 256 main frames.

The processor provides an analog-to-digital converter which produces the eight bit digital values for all analog measurements providing an accuracy of ± .2% ± 1/2 LSB. Included in this figure are all error contributions from the processor input, at sampling time, to the processor output. The voltage range for encoding is 0 to 5.12 VDC.

The PCM processor generates the satellite time word (STW). The STW consists of 28 bits and allows for an accumulation through 194 days. The four least significant bits of the STW serve as a subcom identifier while least significant bits 5 through 8 identify the sub-subcom frame. The synchronization pattern is contained in main frame words 126, 127 and 128.

2.2 Data Processing Systems

Due to the volume of data to be processed, the complexity of the processing requirements and the necessity of taking a systematic approach to

the data processing task, a data processing system (DPS) was developed and implemented for S3-1. The DPS allowed for maximum data flow, flexibility of implementation and adaptability to future vehicles. In fact, the S3-1 DPS was generalized for use with the S3-2 and S3-3 spacecrafts. The program interfaces and general data flow are identical in the DPS for all three vehicles although versions of some programs exist for each spacecraft.

In order to understand the effort involved in the creation of the geophysical unit data bases and unified history file, a brief description of the data processing system is now presented. The processing may be thought of as occurring in two phases. Figure 1 is a flow diagram of Phase I of the DPS while Figure 2 represents the Phase II program interfaces. For vehicles S3-1 and S3-2, both phases are implemented. For satellite S3-3, only Phase I is required.

In Phase I, all files to be input into the individual experiment data processing routines are created. These files consist of the raw experiment data files, magnetic parameter and ephemeris files, atmospheric model files and files containing the coefficients to be used in determining vehicle attitude. In Phase II, the individual experiment processing routines are executed and geophysical unit data bases for each spacecraft revolution are created. For satellite S3-1, in addition to these geophysical unit data bases, a unified history file containing reduced data from all probes is to be created. Through history file usage, reduced geophysical unit correlations may be made for all probes which are simultaneously studying the same atmospheric phenomena. Moreover, the unified history file results in compaction of the data to one flexible file.

The PCM data transmitted from the vehicle is recorded on tape at various SCF remote tracking stations. These tapes are, in turn, sent to the Space and Missile Test Center (SAMTEC) for digitization and storage onto 9 track tape.

The file name used by SAMTEC for this digital data is the Standard Telemetry Format (STF). The STF for each orbit consists of a file descriptor record (FDR), data index records (DIR), data index continuation records (DIC), data records (DR), end of data records (ED) and end of real records (ER).

DPS - PHASE I

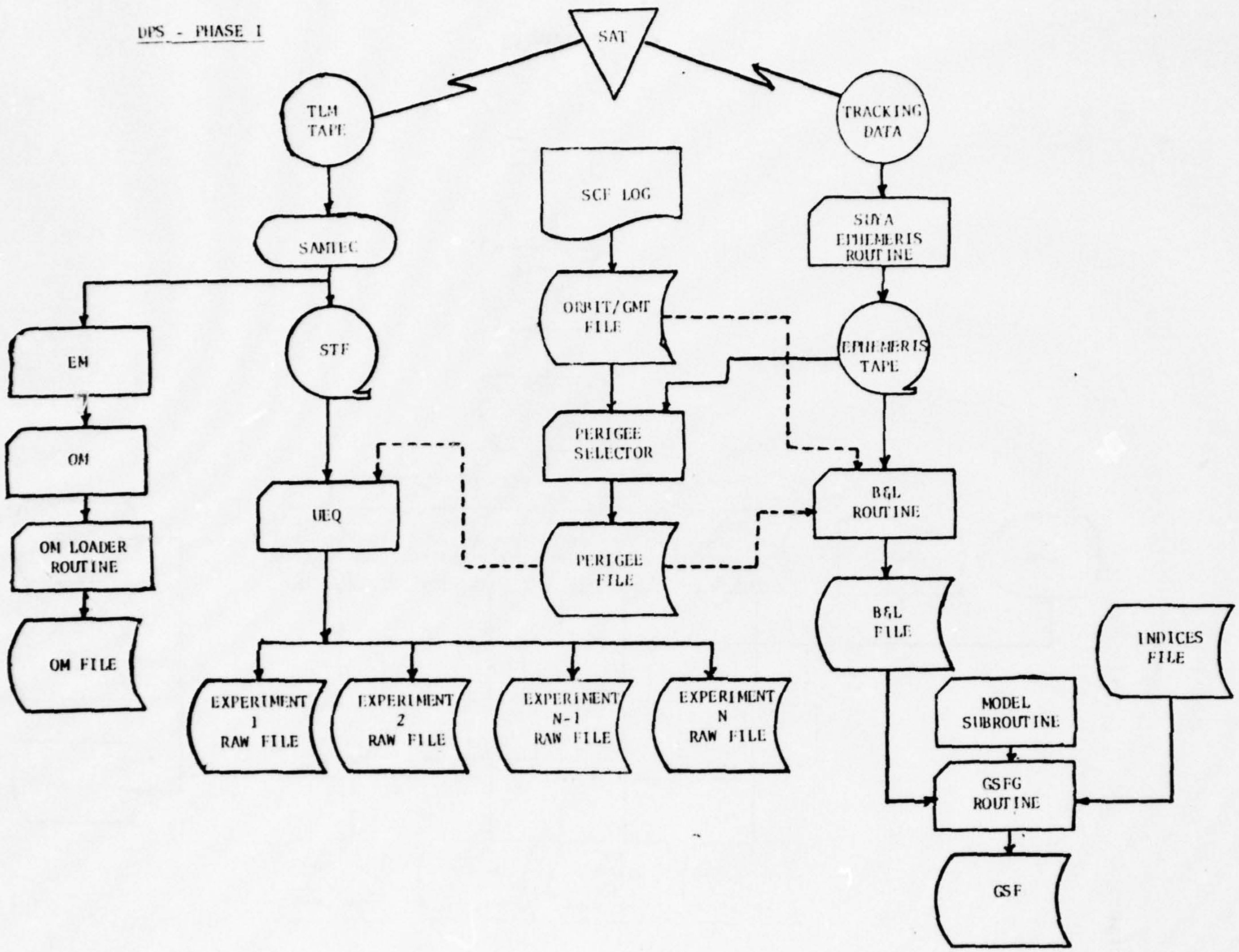

Figure 1

DPS - PHASE II

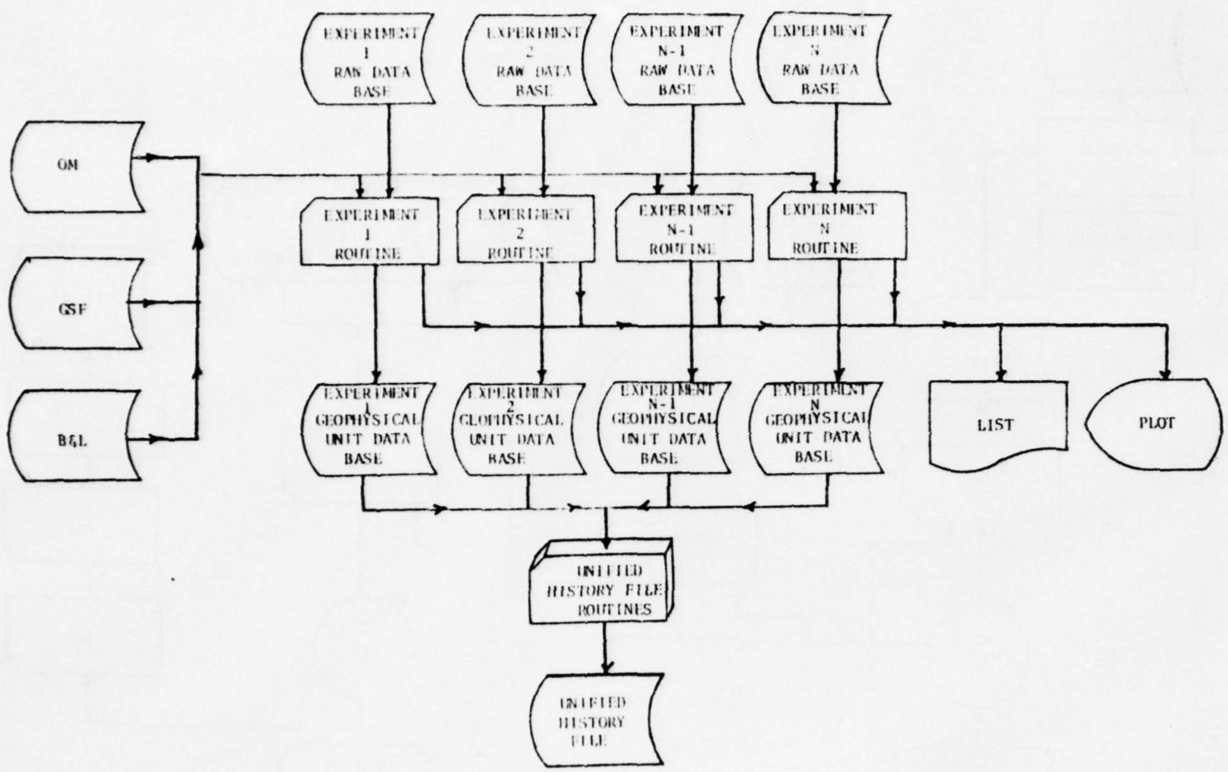

Figure 2

The FDR contains parameters related to the particular orbit on the STF tape, such as, analog tape number, date of orbit and date of digitization. DIR and DIC records exist for the purpose of defining word locations within DR's for both clock correlation factors and all word designations from the telemetry data. Data records for the telemetry data always begin with sub-com frame 1, but the first data frame on each STF tape is random relative to the sub sub-com frame. Sync and spare words are deleted in the digitization process. Thus, in general, the DIR and DIC information will not be consistent from one STF tape to another. The ED records signal the end of information for the time correlation and telemetry information for each STF tape. ER is the signal for end of reel operations. The set of data products received at AFGL/SUA for each orbit processed through the SAMTEC digitization system is the STF tape, its associated scan listing and a deck of cards for attitude determination. The scan listing contains orbit number, start and stop times of the digitized signal and satellite time words (STW) at which digital dropout occurred. The card deck, generated in conjunction with the STF creation, results from a computer routine called the Estimation Module (EM). The cards contain sets of coefficients to be used in the computation of vehicle attitude.

Another item used in the DPS is the Satellite Control Facility tape recorder log. Copies of this log are also received by AFGL/SUA.

With these items provided by sources external to AFGL, the first phase of the DPS is ready for implementation.

A card image file of the SCF tape recorder log, called the Orbit/GMT file, is created. This file contains the orbit number, date and start and stop times of each tape recorder orbit. For S3-1 and Group II operations for S3-2, prime data occurred for the AFGL probes in the perigee region of each orbit but satellite turn-on normally occurred prior to an extending beyond the perigee region. In order to determine the areas of each pass containing the prime data, a computer routine was written to input the orbit/GMT file and to interrogate ephemeris files. Outputs from the perigee selector routine consist of the orbit number, date and start and stop time of the perigee sections. These parameters are stored on a file which can be displayed but which is also used as input to routines written to construct

the experiment raw data files and their associated model and magnetic parameter files. The use of the perigee information file plays a key role in data compaction for the B&L and GSF files for S3-1 and S3-2 Group II operations. The orbit/GMT file plays a similar role for S3-2 Group I data as well as the S3-3 data.

When the STF, scan listing and EM deck are received at AFGL/SUA, the tape number and pertinent orbit information are entered into a cross-reference log, the scan listing is filed and the card deck, called the output module (OM), is prepared for loading onto a monthly OM file. Since the SAMTEC digitization process is not done chronologically by orbit number, the systematic approach taken in the storage of these cards is to create one file for each month of vehicle lifetime. A cross-reference listing of file and orbit number is produced whenever OM data is added to any file.

Since the STF contains data from the full PCM data stream, a computer routine was written to create raw data files for each experiment. This routine is called the unpack/edit/quality check (UEQ) routine. This routine uses as input the STF tape and pertinent information from the perigee file, if applicable, such as the prime data area. Perigee file usage is required only on S3-1 and S3-2. The UEQ then extracts all necessary information from the FDR, DIR and DIC; unpacks data records according to DIR and DIC specifications; quality checks time code information and sub-com frame numbers; determines occurrences of signal loss; edits out bad data frames; calculates GMT from the STW information; performs averages of specific designations as necessary; and creates a raw data file for each experiment in a format which optimizes data storage and retrieval. Permanent storage of output files is, of necessity, accomplished through the use of off-line devices. A version of the UEQ exists for each of the S3 vehicles.

The SCF sends tracking data to AFGL/SUA and this data is, in turn, used by SUA to produce ephemeris files. These files created by SUA cover periods of one month at a time with data provided in 1 minute intervals. Parameters contained on the SUA ephemeris file include altitude, longitude, geocentric and geodetic latitude, vehicle velocity in component form and local time. Since the data on the file covers a full one month period, it can be compacted by selecting out only the areas for which telemetry data was acquired.

Since all processing routines for the individual probes require ephemeris as well as magnetic parameters, the ephemeris compaction and combination ephemeris and magnetic file (B&L file) is created in the next step of the processing system. An existing routine was modified for use with these satellites. The modified routine, called the B&L program, uses as input the monthly ephemeris file and the pertinent parameters from the perigee file (or orbit/GMT file) to create a B&L file for the prime data of each orbit. One B&L tape is created for each month of the lifetime of the satellites. Among the quantities stored on the B&L file for each orbit are all pertinent ephemeris parameters, magnetic field components, total field, L-Shell and geomagnetic longitude, latitude and local time. Data occurs at 60 second increments for each pass. A modular subroutine was written for the extraction of any or all of the quantities on the B&L file at any time during an orbit. Versions of the B&L routine exist for each of the three satellites.

An INDICES file was created for the lifetime of satellite S3-1 and is being maintained and updated for S3-2 and S3-3. This file contains all geophysical indices necessary for the interpretation of geophysical unit measurements and for the calculation of model atmospheric parameters. Among the parameters contained on this file are Kp, $F_{10.7}$ CM solar flux, Ap, DST index, calcium plage indices, solar flare indices and solar declination. A modular routine, GPARAM, was written to interrogate this file and to allow for the determination of any of the above quantities for any orbit during the lifetime of a vehicle.

Most of the AFGL probes flown aboard S3-1 and the Group II probes from S3-2 perform neutral atmospheric measurements. The processing requirements for these probes include the knowledge of selected atmospheric neutral model parameters. To this end, the Geophysical Support File (GSF) is created. The GSF contains parameters such as exospheric temperature, temperature at altitude, mass density and number density for various constituents. The routine used to create the GSF is called the GSFC and it uses an SUA supplied subroutine to perform the actual model computations. Inputs to the GSFC are the B&L file and the INDICES file. Thus, the GSF are created on a one tape per month basis with file and orbit numbers matching those of the B&L file.

File formats for the B&L, GSF and INDICES file are included in the appendix.

Programs to be executed in the second phase of the DPS require raw data files, B&L files, OM files and in some cases GSF files.

Software developed in both phases of the DPS was written in modular fashion in order that multi-purpose routines could be used wherever elements of commonality exist in the processing requirements.

The processing routines developed for Phase II of the DPS create the geophysical unit data bases. These routines also create listings and displays of the geophysical unit parameters along with selected.

2.3 S3-1 Data Base

As mentioned in the introduction, the data bases for the probes flown aboard this spacecraft have been nearly completed. The addition of data from a small percentage of problem orbits will complete these data bases. A brief description of each of the S3-1 probes for which data bases were created is included in this section.

Satellite deceleration due to aerodynamic drag was measured by the MESA accelerometer and from the aerodynamic drag, neutral atmospheric density was derived. The sensing element of the instrument consists of an electrostatically suspended proof mass which is electrostatically force rebalanced along its sensitive axis. A digital output which represents the pulse rate and which is proportional to the applied acceleration is obtained from the restoring voltages. The probe is capable of operating in two sensitivity ranges. Range A provides low sensitivity measurements. The normal operational mode for the instrument was range B.

The MSI is an RF quadrupole mass spectrometer designed to provide atmospheric species measurements between 14 and 44 amu. Density measurements for O, O_2, N_2, NO and A_r were obtained. The experiment was not synchronized to the PCM encoder and the instrument output was therefore free running with respect to the data stream. Probe operation consisted of two modes, each of approximately 12 seconds duration. One 12-second mode consisted of four

scans of masses from 14 through 44 amu. While in the second mode, only N_2, (28 amu) was examined.

The main output for the Cold Cathode Ionization Density Gauge is gauge current which was sampled at 16 points per second. The gauge current values were modulated by satellite spin with the maximum amplitude of the signal occurring at the minimum attack angle (the angle between the instrument's look angle and the velocity vector). The instrument was designed to provide atmospheric neutral density measurements and spatial and temporal variations.

The MSIV instrument was composed of an RF quadrupole mass spectrometer and a velocity mass spectrometer to measure atmospheric composition and species density of masses between 1 and 44 amu. The instrument was designed for operation in five different modes with mode switching occurring only by command to the spacecraft. Operation of the instrument was synchronized to the PCM encoder for each of the five modes. The spectra measurement from the instrument was a 24 bit digital output. Through the various modes, outputs were provided for ion, neutral high and neutral retarded measurements.

The processing and analysis techniques (including functional flow diagrams) used in the creation of the data bases for the individual probes were included in a previous report (AFGL-TR-76-0121, Delorey).

The general structure of the data base for each probe is the same. By keeping all files of the same general form, data retrieval and display can be effected through the use of multi-purpose routines. Data from each orbit is contained on a physical file consisting of a header record followed by data records which include the appropriate geophysical unit measurements and selected positional parameters. Information stored in both the header and data records is structured by frame. Two integer count words precede the information in each physical record. These count words represent the number of words in a data frame and the number of data frames in the record.

The MESA data base contains atmospheric neutral density measurements along with GMT, selected ephemeris and magnetic parameters and model density. Data is contained in the file for each orbit at two rates. One data set yields 2 density measurements per vehicle spin cycle (vehicle spin rate was 5±1 rpm). The other data set contains measurements in 2 km increments. The header record

for each orbit contains standard information such as acquisition orbit number, date of orbit, and data taking interval but coefficients to least squares polynomial fits are also included. Density measurements were fit as functions of altitude for the downleg and upleg portions of each orbit.

The MSI data base, which has been completed, follows the same general structure defined above. The header record contains standard information pertinent to the particular orbit. The data records provide density measurements (in number density) for selected constituents and the corresponding positional parameters. The data rate is one frame per 12 second scan mode. This converts to approximately one data set every other vehicle spin cycle. Computer software was developed in order to fit and hence compact the downleg and upleg data sets for each constituent. The fits were performed to number density as a function of altitude.

The Cold Cathode Ionization Density gauge data base is constructed in a manner analagous to the MESA data base. The data records include gauge pressure, ambient pressure, atmospheric neutral density and selected model, ephemeris and magnetic parameters. Data storage occurs at a rate of one frame per vehicle spin cycle. Fitting techniques were applied to the downleg and upleg portions of the density data. The coefficients, from which density versus altitude may be computed, are stored in the header record.

The main data bases created for the MSIV instrument were for the prime operational mode of the experiment-mode 1. In this mode, both ion and neutral high measurements were performed. Thus, there are two data bases for the MSIV; one for ions and one for neutral highs. The header records for each contain standard orbit related parameters such as date of acquisition, orbit number and GMT of the acquisition. The data records for the ion data base contain currents for masses 14, 16, 28, 30 and 32 in addition to selected magnetic and ephemeris parameters. These currents are readily convertable into number density. The data records in the neutral high data base were created in a manner analagous to the ions. These records contain currents for masses 14, 16, 28, 30 and 32. The data rate at which storage occurred for both data bases was one frame per vehicle spin cycle. Computer

software has been developed for the fitting of the upleg and downleg portions of each orbit with the resultant coefficients having density versus altitude applications.

The data bases for the individual probes are used to study structure within individual orbits and to perform analyses on small or large segments of the data. The creation of these data bases has yielded a tremendous compaction of the data. Approximately 1500 STF tapes were originally received and the geophysical unit data bases for all probes now reside on approximately 15 tapes. Thus, the compaction ratio is 100:1. A data base list routine was developed whereby selected parameters relevant to each acquisition and the file location for each probe within the data base are displayed. The geophysical index Kp is also displayed on the listing. A sample of the data base printout and the formats for the individual data bases are included in the appendix.

The concept of the unified history file was developed to provide a flexible data base from which studies of long term effects could be performed. This data base which is presently being put into final form will contain coefficients to fits which will allow the computation of geophysical unit parameters from each of the individual data bases. Note that these coefficients already exist in the header records of each orbit for the MESA and ion density gauge. Further, as already mentioned, software was developed to produce the coefficients for the mass spectrometers. Similar techniques were employed to produce coefficients for selected model parameters. Thus, the coefficients can be used to obtain geophysical unit or model data. Ephemeris and magnetic parameters are also selectable from the unified history file. The geophysical indices associated with each orbit are also retrievable. A display of the geophysical indices over the lifetime of the vehicle is included as Figure 3. The indices are displayes as a function of date. Displays have been created for some of the probes reflecting mass density at fixed altitude with additional grids for Kp, $F_{10.7}$ CM solar flux and latitude and local time of perigee. Additional constraints can easily be placed on data selection to, for instance, extract only orbits which fall into specific Kp ranges. The coefficients are the key element in extracting the geophysical unit measurements. One further advantageous feature of the unified history file

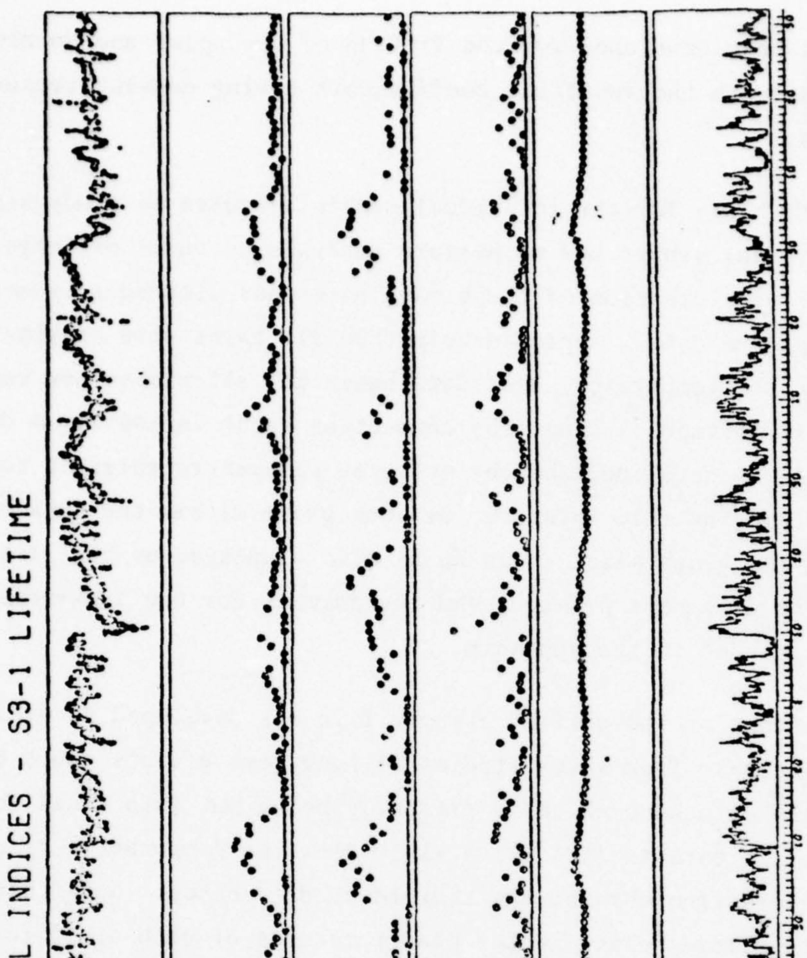
GEOPHYSICAL INDICES - S3-1 LIFETIME
DST
CA PLAGE
SUN SPOT
AP
F10.7
KP
NOVEMBER 74
DECEMBER 74
JANUARY 75
FEBRUARY 75
MARCH 75
APRIL 75
MAY 75

Figure 3

is that of data compaction. It is estimated that, when in final form, this entire file will be contained on one tape. Thus, the final data compaction ratio from STF to unified history file will be 1500:1.

2.4 S3-2 Experiments, Analysis and Software

For the S3-2 spacecraft which is still in orbit, geophysical unit data bases are being developed for the Fluxgate Magnetometer, Electrostatic Analyzer, MSIV and Cold Cathode Density Gauge (IDG). The data for the Piezoelectric accelerometer is selectively processed.

Data base development implies the continuance of UEQ executions and the creation of B&L, GSF, OM and indices files in a systematic manner.

This section contains a brief description of each experiment and the analysis and computer software which were developed.

2.4.1 Cold Cathode Ion Density Gauge

The S3-2 cold cathode ion density gauge flown was designed to provide atmospheric neutral density measurements and spatial and temporal variations. Basically, the output signal from the probe is modulated by the spin of the vehicle with the maximum response occurring when the angle between the intrument and the satellite velocity vector is at a minimum. Gauge current is the direct measurement of the instrument. The current is converted to pressure and then, through analysis techniques analagous to those developed for S3-1, atmospheric neutral density is computed.

Instrument readouts and data rates are summarized below:

Gauge Current	16 pps
Range Indicator	16 pps
High Voltage	1 pps
Electronics Temperature	.0625 pps
Gauge Temperature	.0625 pps

Due to the higher perigee of this vehicle, as compared to S3-1, many of the anlysis techniques developed for S3-1 required tailoring for application to this spacecraft. The basic instrument readouts were quite similar to those of S3-1.

The functional flow of data through the main processing routine is summarized below.

The frames of raw telemetry data are input through the use of a modular input routine. Instrument range, gauge current and gauge pressure are then calculated on a point-for-point basis. Instrument attack angles are then calculated for all pressure values through the OM module and OM file. The data is then separated into the decreasing and increasing attack angle portions of the ram cycle. The instrument sampling function, R (S,D,α), is computed. Gauge pressure is fit as a function of the R (S,D,α) for the separated portions of the spin cycle. The data fitting is accomplished through a modular polynomial routine. Slopes of the fitted curves are extracted and corrected pressures are calculated for the into and out of ram portions of the satellite rotation and these pressures are then averaged and atmospheric neutral density is computed. All necessary ephemeris parameters are then extracted from the B&L file and atmospheric neutral density is calculated. Selected model atmospheric parameters are extracted from the Geophysical Support File. These parameters include mass density, pressure and temperature at altitude.

Each program execution results in the creation of listings, plots and the data base. The parameters listed and plotted are quite similar to those resulting from S3-1 program exeuctions. The data base for each orbit consists of a header record and data records contain the computed geophysical unit, ephemeris, magnetic and model parameters.

2.4.2 Mass Spectrometer (MSIV)

The mass spectrometer flown aboard the S3-2 satellite was similar to the MSIV flown on satellite S3-1. The probe was made up of an RF quadrupole mass spectrometer in combination with a velocity mass spectrometer. The probe was designed to measure atmospheric composition and species density. Species studied were between 1 and 44 amu with both neutral and ion measurements of O, N_2, NO, N, H and H_e provided. The operation of this MSIV experiment was synchronized to the PCM encoder and five commandable modes of operation were possible. The prime output from the probe was a 24 bit digital readout. Instrument readouts and associated data rates are summarized below:

It is possible that the gain values (G) in Table VI will be modified after some of the data is reduced and spectral radiance features in each of the four gain channels are compared.

24 bit digital spectra	64 pps
RF Monitor	64 pps
Beam (EMR) Monitor	4 pps
Pressure Monitor	8 pps
Ratio (V_R) Monitor	8 pps
DC Monitor	8 pps
Commutator	1 pps
Mode Monitor	1 pps
High Voltage (HV) Monitor	2 pps

The probe could be operated in 5 modes. Mode 1 was capable of providing a combination of neutral high (NH) and ion measurements or be operated in an ions only mode. Mode 2 provided a combination of neutral high and neutral retarded measurements. In mode 3, the data set consisted of NH only. Mode 4 and mode 5 were primarily diagnostic.

For all modes, the RF monitor indicated the mass being sampled. The 24 bit digital spectra output contained a range bit and the number of counts measured by the multiplier. A maximum of two output ranges was possible. A one readout lag was programmed between the RF monitor and the spectra output (the spectra lagged the RF monitor by one readout) but the lag sporadically extended to 2 readouts. The experiment timing cycle was 1 second for modes 1, 2 and 3; 2 seconds for mode 4 and 8 seconds for mode 5. In modes 1, 2 and 3 there were four readouts for each mass, thus producing a peak shape. Several monitors were also included as instrument outputs.

The main emphasis has been placed on the processing of the mode 1 data. In this mode, the instrument can be commanded to perform ion/neutral high or ion data only measurements. The mode monitor voltage is used to discern the measurement type. In ion only mode, data processing and analysis are performed on masses 14, 30, 28, 16, 1 and 4. In the ion/NH mode, ion measurements are performed on masses 14, 30, 28 and 16 while neutral high masses examined are 1, 4, 7, 14, 30, 28 and 16.

The functional flow of data through the mode 1 routine may be summarized as follows. The instrument mode is determined first. Then, the instrument

range is extracted and the corresponding multiplier counts converted to current. Attack angles corresponding to the currents are computed using the OM module.

For ion data, the peaks are translated to ram using a function dependent only on attack angle and the four seconds of data closest to ram are scanned and one group of ion readouts is selected for analysis based on criteria involving current amplitude. Ratio monitor (R_A) data associated with ion readouts is converted to current and translated to ram. Magnetic pitch angle is calculated and pertinent positional parameters such as longitude, geodetic and geomagnetic latitude, local time and magnetic field are computed from information contained on the B&L file. A number of ratios involving individual currents, summed currents and the R_A are then computed.

For neutral high data, statistical techniques are employed in the data selection. The four readouts around each mass peak are examined, and after removing the two extrema, the remaining points are averaged. This procedure is employed for each mass in the four frames of data closest to ram. Once an average current value is obtained for each mass in those four frames, the currents are translated to ram by use of the neutral high sampling function. Statistical checks are then performed and one current for each mass is selected.

Each program execution results in plots, listings and data base storage. The plots and listings of the reduced geophysical unit parameters and associated magnetic and ephemeris information are similar to the S3-1 outputs. The data bases for both the ion and neutral high values are created in a structure similar to the S3-1 files.

2.4.3 Piezoelectric Accelerometer

The triaxial piezoelectric accelerometer flown aboard the spacecraft provides atmosphere neutral density measurements. Satellite deceleration, due to aerodynamic drag, is measured along the three mutually orthogonal axes. Instrument outputs are analog signals (0V to 5V) with readouts for three sensitivity levels along each axis. The telemetry words and data rates are summarized below:

X-axis	range 3	4 pps
X-axis	range 2	1 pps
X-axis	range 1	1 pps
Y-axis	range 3	1 pps
Y-axis	range 2	1 pps
Y-axis	range 1	1 pps
Z-axis	range 3	1 pps
Z-axis	range 2	1 pps
Z-axis	range 1	1 pps
Temperature		.0625 pps

The processing of data from this probe is done selectively. Mathematical and computer techniques developed for the reduction and analysis of accelerometer data from previous spacecrafts were adapted and modified for use with S3-2 piezoelectric accelerometer.

Filtering techniques are required in the processing of this accelerometer data. The computer routine filters the signal in order to determine the portion of data due to atmospheric drag. A power spectral analysis of the data revealed the existence of two and sometimes three peaks. A numerical notch filter was designed to remove the extraneous signal. Once filtered, atmospheric neutral density measurements are computed. Plots and listings of the mass density measurements as functions of GMT and other ephemeris, magnetic and model atmosphere parameters are output by the routine.

2.4.4 Fluxgate Magnetometer

The fluxgate magnetometers flown aboard the S3-2 spacecraft were designed to measure the 3 components of magnetic field to a resolution of 5 γ. The full scale range for each axis (0V $\rightarrow$ 5V) corresponds to ± 600 γ (.02V corresponds to 4.8 γ).

Each axis has a neutralizing winding current of 10 ma/gauss so that a known biasing field may be applied (to each axis) to keep the magnetometers on scale.

When the voltage level of a fluxgate axis reaches 0.1 or 4.9V the range switch provides current increments of 0.1 ma to the neutralizing coil (0.1 ma corresponds to 1000 γ). These current increments, applied in the proper

direction, keep the magnetometer from saturating. There are 128 different current levels available to each axis which correspond to steps of 1000 γ ranging from -64000 γ to +63000 γ. The current being applied to any axis is determined by the range switching coarse and fine outputs for that axis. For the coarse outputs, there are eight telemetry levels from 0 → 5V in steps of 0.71V (seven steps). For fine outputs, there are 16 levels between 0 → 5V. The 15 steps are in increments of .-3V. The zero current step for coarse is at 2.84V and for fine is at 0V. The current steps for each axis vary from -64 to +63 and the step level may be determined by the expression

$$16N + M$$

where

N,M are integers determined by

$$N \simeq \frac{\text{coarse volts} - 2.84}{.71}$$

$$M = \frac{\text{fine volts}}{.33}$$

Saturation levels for any range switch axis are determined by a coarse-fine voltage pair of (0.0,0.0) or (5.0,5.0).

Instrument outputs and associated data rates are as follows:

X-magnetometer	32 pps
Y-magnetometer	32 pps
Z-magnetometer	32 pps
X-axis range switch-fine	16 pps
Y-axis range switch-fine	16 pps
Z-axis range switch-fine	16 pps
X-axis range switch-coarse	2 pps
Y-axis range switch-coarse	2 pps
Z-axis range switch-coarse	2 pps
Sensor temperature	1 pps
Electronics temperature	1 pps
Range switch temperature	1 pps

All outputs are analog. The data for this payload is processed in two phases due to the high sensitivity of the instruments; differing readout rates for the fine, coarse and magnetometer designations; and the uncertainty of the alignment for the boom mounted sensor axes.

The first phase, called the preprocessing, is performed in order to create a data base of raw magnetometer readings (in gammas). Corrections for erratic fine and coarse readouts are performed in this routine. A more detailed description of the analysis efforts involved in the preprocessing is contained in a previous report (AFGL-TR-77-0103, Delorey). Plots, listings, and the raw magnetic field data base result from each execution of the preprocess routine.

The final processor uses the raw magnetometer data base and B&L files as input. Data is processed only in areas where the absolute value of the latitude exceeds 45°. The steps performed in this routine include the following:

i) Digital filtering of the x, y and z magnetic field measurements to produce smoothed signals.

ii) Computation of a correction to the η_2 angle (caused by the twisting of the boom-mounted sensor axes). This angular correction is not constant for each orbit and is, thus, expressed as a function of time.

iii) Calculate model magnetic field components and total field in the spacecraft coordinate frame of reference.

iv) Transform the spacecraft principal axis measurements into the coordinate frame of reference used to express the model field parameters.

v) In the model field coordinate system, difference the measured and model x,y,z and total field.

vi) Compute an average curve from the x-axis data (principal axis system) at the extrema values of the signal and subtract from this curve the transformed y model field component.

vii) Plot and list the computed parameters along with associated ephemeris and magnetic information.

viii) Create a final data base in the same generalized structure as for other S3 probes.

2.4.5 Electrostatic Analyzer

The S3-2 electrostatic analyzer was designed to perform a 32 channel differential energy analysis of electrons between approximately 1 kev and 16 kev by means of electric field deflection through a parallel plate system. A channeltron electron multiplier is used to detect the selected electrons which are counted in a 10 bit binary counter with an additional overflow bit indicator. An inflight calibration source and test pulse generator are included within the instrument to assure the accumulation of one count during each data interval.

A 5 bit up/down counter programs the deflection voltage in a 64 step sequence. The counter steps from 00000_2 to 11111_2 then back to 00000 in 64 steps. The 10 bit data counters, 1 bit overflow indicator and 5 bit up/down control counter are read out as a single 16 bit word at the uniform rate of 64 samples/second. The five bit control counter is incremented every other readout; therefore, a complete 64 step sequence (32 up, 32 down) is completed every 2 seconds.

There are 10 analog monitors which provide outputs used to ascertain proper instrument performance. Monitors 26-11-9 and 26-11-10 will assume different levels for each energy channel.

For the overflow bit, the normal value is 1. An overflow is indicated by a 0 value.

Instrument outputs and associated data rates are as follows:

ESA output (16 bit digital)	64
+5v monitor	2
+15v monitor	2
-5v monitor	2
+10v reference monitor	4
+28v monitor	1

Temperature monitor	1
+3kv monitor	8
+3kv input current monitor	8
-10kv input current monitor	8
-10kv reference input monitor	8

Computer software has been developed to create an ESA data base and to perform analyses upon the data base. This processing occurs in two phases.

In the first phase, science data is produced and a data base is created for later use in the analysis phase. The basic functions of this software may be summarized as follows:

The 16 bit digital readout is decoded and the accumulated counts are extracted; the readouts are ordered into 2 second data frames; areas of digitization dropout are dummy filled and flagged in order to maintain a consistent file structure; magnetic and ephemeris parameters are merged; average energy, average flux and total flux are computed on a sweep by sweep basis; plots listings and the data base are created. For each orbit, the listings are broken down into three sections: GMT and the raw counts readout by the instrument with areas of data dropout flagged; the housekeeping monitors converted to voltage and one minute averages of the monitors; GMT, magnetic pitch angle, average energy, average flux and total flux. Displays generated by the routine are segmented to produce one set of plots for each hemisphere. Each set of plots represents average energy, average flux, total flux and magnetic pitch angle as functions of GMT. Additional axes yield annotation for altitude, geodetic latitude, longitude, magnetic local time, invariant latitude and geomagnetic latitude. The data base consists of a header record followed by data records structured to allow easy input to analysis routines. Data records contain GMT, ephemeris and magnetic parameters and counts. The counts are always stored such that energy level 00000_2 begins the frame.

Two analysis routines have been written to access the ESA data base; the first produces displays of spectra (flux versus energy) for individual sweeps while the second routine is used to sort data into selectable bins and perform averages and statistical evaluations.

The basic functions of the second routine may be summarized as follows: the data from the data base is input to the routine and the orbit is immediately separated into the sunlight and shaded portions since the data is to be treated separately for the two cases; the data is then sorted into predefined latitude bins with starting, ending and incremental values optional; for each latitude bin, the counts are converted to flux and the flux values are sorted into energy bins of optional width; for each energy level, the average flux and statistical error is computed; flux data is sorted into predefined magnetic pitch angle bins (of optional width) for each energy bin and average flux statistical error and average energy are computed; finally, for each magnetic pitch angle bin, average energy, total energy flux and total flux are computed. Formulae used in this routine were detailed in a previous report (AFGL-TR-77-0103, Delorey).

3.0 SCATHA SATELLITE

In this section, an overview of the SCATHA project, telemetry systems and agency file concepts are discussed.

3.1 Overview

The P78-2 spacecraft is part of an Air Force project to investigate Space Charging at High Altitude (SCATHA). The vehicle will be launched into a near synchronous orbit. On-orbit data will be controlled by the Satellite Control Facility and its remote tracking stations. The duration of the mission is scheduled for 12 months.

The vehicle is scheduled for launch from the Eastern Test Range in 1979. The space vehicle (SV) will initially be placed in a circular parking orbit from which it will be placed into a transfer orbit at the first ascending node. At apogee after 3 1/2 revolutions in the transfer orbit, the vehicle will be placed into its near synchronous final orbit with a 2.5 degree inclination. The approximate apogee and perigee in final orbit are 23100 nmi and 15038 nmi, respectively. This orbit will result in a nominal longitudinal drift of 6 degrees per day. The orbital orientation is such that the vehicle will experience a sequence of altitudes near synchronous altitude at local midnight during the vernal eclipse season.

The vehicle is expected to acquire up to 24 hours of data per day for the 1 year period. The payloads to be flown aboard the vehicle were designed to provide data related to charging, discharging and plasma interaction phenomenae. In particular, investigations will be made on different particle types and energy ranges; magnetic field intensities of both the environment and those generated by the SV; the effects of charging and discharging on spacecraft materials; the interaction of the charging and discharging phenomenae with SV operation and the techniques for controlling the SV charge condition.

3.2 Telemetry

The P78-2 telemetry system provides for the transmission of PCM and FM data. There are two primary encoders, an auxiliary encoder and two tape recorders aboard the vehicle.

The characteristics of the primary encoder may be summarized as follows:

128 words/mainframe
8 bits/word
1024 bits/mainframe
8 mainframes/seconds
8192 bits/second
128 mainframes/masterframe
16 seconds/masterframe.

The auxiliary encoder may be characterized in summary form as follows:

64 words/mainframe
8 bits/word
512 bits/mainframe
1 mainframe/second
512 bits/second
4 mainframes/masterframe
4 seconds/masterframe.

The broadband analog data from the vehicle will provide high rate information for several experiments. Five modes were defined for broadband operations but only one mode may be operated at any time.

3.3 Agency Tapes

A new concept, called the agency tape (AT), will be used by SAMTEC in the digitization of data for the SCATHA satellite. This new type of file replaces the STF used for the S3-1, S3-2 and S3-3 satellites. The actual file structure has resulted from meetings between SUA, SDAL and SAMTEC personnel. Rather than digitizing the entire PCM mainframe, an agency tape is created for each experiment which contains only the specific designations requested. Each orbit on the AT will have at least four types of records; header record, scan record, event record and telemetry records. The header record contains information specific to the vehicle and orbit such as orbit number, date of orbit, GMT at the start and end of the pass. The scan record will contain information pertaining to areas of digitization dropout. The event record is specific to each agency tape type. It may contain information from the telemetry stream obtained in the first pass of the 2 pass SAMTEC system.

The telemetry records contain GMT and the digital values for the specified designations.

One of the preliminary efforts of the SDAL with respect to this vehicle has been to aid the SUA analysts in defining agency tape information. From the overview section it is seen that coverage of up to 24 hours per day may be expected. Thus, it is obvious that efficient storage of the PCM data into the data records is imperative. The structure which was defined results in significant data compaction yet allows for compatibility with S3 system techniques.

It is suggested that each record contain masterframes of data with each masterframe starting at the mainframe containing subcommutator frame 0. By storing masterframes, as opposed to mainframes, on each physical record, a maximum of information may be stored on each magnetic tape. Further, by storing each masterframe in a consistent manner (starting at subcommutator level zero), the necessity of having individual processing routines search each file to find word locations of subcommutated data is removed. This will help in minimizing the computer coding in these routines. The more important factor, however, is data storage. Estimates were made using the preliminary telemetry lists from two of the AFGL probes aboard the vehicle and these estimates were used to conclude that a full day (24 hours) of data could be stored on each agency tape.

APPENDIX A

B%L FILE FORMAT

B&L-File Header Record

0.1	Word Count	
0.2	Group Count (1)	
1	Satellite name	A
2	Modified Julian date at start of pass	F
3	Month of year at start of pass	F
4	Day of month at start of pass	F
5	Year (last two digits of 19xx)	F
6,7	Coefficients used in mag. field calculations	A
8	Epoch year of coefficients	F
9	Date coefficients initially updated to	F
10	Start time of pass (GMT) seconds	F
11	End time of pass (GMT) seconds	F
12	Time increment (seconds)	F
13	Indicator for magfield package 0. = INVAR/FIELDG, 1. = SHELLG/FELDG	F
14	Error value for INVAR	F
15	Semi-major axis (km)	F
16	Eccentricity	F
17	Inclination	F
18	Right ascension of ascending mode	F
19	Argument of perigee	F
20	Time of perigee (GMT) sec - neg → N/A	F
21	Altitude of perigee (km)	F

B&L-File Header Record (Cont.)

22	Longitude of perigee (+E)
23	Latitude of Perigee (geodetic)
24	Local time of perigee - seconds
25	Time of apogee (neg → no apogee)
26	Altitude of apogee (km)
27	Longitude of apogee (+E)
28	Latitude of apogee (geodetic)
29	Local time of apogee - seconds
30	Start time of vehicle in sun_1 (neg → N/A)
31	End time of vehicle in sun_1 (neg → N/A)
32	Start time of vehicle in $shade_1$ (neg → N/A)
33	End time of vehicle in $shade_1$ (neg → N/A)
34	Start time of vehicle in sun_2 (neg → N/A)
35	End time of vehicle in sun_2 (neg → N/A)
36	Start time of vehicle in $shade_2$ (neg → N/A)
37	End time of vehicle in $shade_2$ (neg → N/A)
38	Longitude at start of pass
39	Longitude at end of pass
40	Latitude (geodetic) at start of pass
41	Latitude (geodetic) at end of pass
42	Altitude at start of pass
43	Altitude at end of pass
44	Rev no.
45-50	Vacant

B&L - File Data Records

0.1	Word count
0.2	Group count
1	Modified Julian Date
2	Calendar month
3	Calendar day
4	Calendar year
5	Hour of day
6	Minute of hour
7	Second of minute
8	GMT in seconds
9	x coordinate of position vector (km)
10	y coordinate of position vector (km)
11	z coordinate of position vector (km)
12	x coordinate of velocity vector (km/sec)
13	y coordinate of velocity vector (km/sec)
14	z coordinate of velocity vector (km/sec)
15	Satellite altitude (km)
16	Distance of satellite from center of earth (km)
17	Satellite velocity (km/sec)
18	Geocentric latitude (±90°)
19	Geodetic latitude (±90°)
20	Satellite longitude (+E)
21	Geomagnetic local time (seconds)
22	Local time (seconds)

B&L - File Data Records (Cont.)

23	x coordinate of magnetic field (geodetic) in gamma's
24	y coordinate of magnetic field (geodetic) in gamma's
25	z coordinate of magnetic field (geodetic) in gamma's
26	Geomagnetic coordinate - B
27	Geomagnetic coordinate - L
28	Geomagnetic latitude
29	Geomagnetic longitude
30	Magnetic inclination
31	Magnetic declination
32	Invariant latitude
33	Corrected geomagnetic latitude
34	Corrected geomagnetic longitude
35	Local corrected magnetic time
36	Solar zenith angle
37	Solar longitude
38	Solar right ascension
39	Solar declination
40	Mean anomaly
41-50	Vacant

APPENDIX B

GSF FILE FORMAT

(GSF) Geophysical Support File Header Record

CDC	FORMAT	DESCRIPTION
0.1	I	Word count
0.2	I	Group count
1	A	Satellite name
2	F	Modified Julian date
3	F	Month of year at start of pass
4	F	Day of month at start of pass
5	F	Year of month at start of pass
6	F	Time at start of pass-GMT (Sec)
7	F	Time at end of pass-GMT (Sec)
8	F	Time increment
9	F	Semi Major axis at start of pass
10	F	Eccentricity at start of pass
11	F	Inclination at start of pass
12	F	Right ascension of ascending node
13	F	Argument of perigee
14	F	Time of perigee-GMT Sec (neg $\rightarrow$ N/A)
15	F	Altitude of perigee (km)
16	F	Longitude of perigee (+E)
17	F	Latitude (geodetic) of perigee
18	F	Local time of perigee (Sec)
19	F	Time of apogee-GMT Sec (neg $\rightarrow$ N/A)
20	F	Altitude of apogee (km)
21	F	Longitude of apogee (+E)

(GSF) Geophysical Support File Header Record (Cont.)

CDC	FORMAT	DESCRIPTION
22	F	Latitude of apogee (geodetic)
23	F	Local time of apogee (sec)
24	F	Start time of vehicle in sun_1 (neg → N/A)
25	F	End time of vehicle in sun_1 (neg → N/A)
26	F	Start time of vehicle in $shade_1$ (neg → N/A)
27	F	End time of vehicle in $shade_1$ (neg → N/A)
28	F	Start time of vehicle in sun_2(neg → N/A)
29	F	End time of vehicle in sun_2 (neg → N/A)
30	F	Start time of vehicle in $shade_2$ (neg → N/A)
31	F	End time of vehicle in $shade_2$ (neg → N/A)
32	F	F10.7 cm solar flux ($F_{10.7}$)
33	F	F (3 month average)
34	F	K_p value
35	F	A_p value
36	F	Longitude (+E) at start of pass
37	F	Longitude (+E) at end of pass
38	F	Latitude (geodetic) at start of pass
39	F	Latitude (geodetic) at end of pass
40	F	Altitude at start of pass
41	F	Altitude at end of pass
42	F	Rev no. (f)
43-50	F	Vacant

APPENDIX C

INDICES FILE FORMAT

Indices File Format

WORD NO.	FORMAT	DESCRIPTION
1	F	Month of year
2	F	Day of month
3	F	Year (last 2 digits of 19xx)
4-11	F	K_p values (8)
12	F	$F_{10.7}$ cm solar flux
13	F	Solar declination
14	F	A_p
15	F	Relative sunspot number
16	F	Daily solar index
17	F	Calcium plage
18-41	F	Hourly D_{st} index

APPENDIX D

MESA ACCELEROMETER DATA BASE

MESA Accelerometer Data Base

Header Record:

0.1	No. of words in header record (45)
0.2	Integer (1)
1	Satellite Name
2	Month of year at start of pass
3	Day of month at start of pass
4	Year (last 2 digits of 19xx)
5	Time at start of pass (GMT sec)
6	Time at end of pass (GMT sec)
7	Time of perigee (GMT sec)
8	Altitude at perigee (km)
9	Geocentric longitude at perigee (Degrees, +E)
10	Geodetic latitude at perigee
11	Local time of perigee (sec)
12	Start time of vehicle in sun (neg N/A)
13	End time of vehicle in sun (neg N/A)
14	Start time of vehicle in shade (neg N/A)
15	End time of vehicle in shade (neg N/A)
16	Start time of vehicle in sun_2 (neg N/A)
17	End time of vehicle in sun_2 (neg N/A)
18	Start time of vehicle in $shade_2$ (neg N/A)
19	End time of vehicle in $shade_2$ (neg N/A)
20	$F_{10.7}$ cm solar flux
21	$\overline{F}$ (3 month average)
22	K_p
23	Orbit Number
24	a_0
25	a_1
26	a_2
27	a_3
28	a_4

Items 24–28: Downleg data coefficients to fit

$$15 + \log\rho = \sum_{i=0}^{4} a_i z^i$$

= density, z - altitude

MESA Accelerometer Data Base

29	b_0	
30	b_1	Upleg data - coefficients to fit
31	b_2	$$15 + \log\rho = \sum_{i=0}^{4} b_i z^i$$
32	b_3	
33	b_4	
34	T_1	
35	C_1	Constants used in bias correcting data
36	T_2	
37	T_2	
38		
39		
40		
41		Vacant
42		
43		
44		
45		

MESA Accelerometer Output Data Base - Data Records

Output values are for ram points only

0.1	Number of words in a group (20)
0.2	Number of groups in a logical record (25)
1	Time (GMT seconds)
2	Altitude
3	Geodetic latitude
4	Geocentric longitude
5	Geomagnetic latitude
6	Geomagnetic longitude
7	Local time (sec)
8	Drag
9	ρ calculated
10	ρ model
11	Ratio (ρ meas/ρ model)
12	Attack Angle
13	L-Shell
14	Orbit normal angle
15	Temperature and bias corrected counts
16	Drag coefficient
17	Geocentric latitude
18	Vacant
19	Vacant
20	Vacant

The ram point outputs for the full pass comprise the first part of the MESA data base.

The second part of the data base is made up of points from the curve fit in 2 km intervals between 250 km and perigee. Perigee point is added.

The two portions of the file are separated by IND = 1, JGRP - 1, DATA = 0.0.

For the fitted data

0.1	Word Count (10)
0.2	Group Count (50)
1	GMT
2	ALT
3	Geodetic latitude
4	Geocentric longitude
5	Geomagnetic latitude
6	Geomagnetic longitude
7	ρ (from fit)
8	ρ model
9	Ratio
10	Local time

APPENDIX E

MSI DATA BASE

MSI Data Base - Header Record

0.1	Word Count (20)
0.2	Group Count (1)
1	Experiment (MSI)
2	Orbit Number
3	Month of Year
4	Day of month of orbit
5	Year (last two digits of 19xx)
6	Start time of orbit (GMT-sec)
7	End time of orbit (GMT-sec)
8	Start time of vehicle in sun-GMT sec (<0→N/A)
9	End time of vehicle in sun-GMT sec (<0→N/A)
10	Start time of vehicle in shade - GMT sec (<0→N/A)
11	End time of vehicle in shade - GMT sec (<0→N/A)
12	$\overline{R}$ (average R for orbit)
13	GMT (sec) of perigee
14	Altitude (km) of perigee
15	Longitude (+E) of perigee
16	Latitude of perigee
17	Local time of perigee (sec)
18	$\overline{T}$ (average sphere temp for orbit)
19	Vacant
20	Vacant

MSI Data Base Data Records

0.1	Word Count (50)
0.2	Group Count (10)
1	Time (GMT sec) ram
2	Altitude (km)
3	Geodetic latitude
4	Longitude
5	Invariant latitude
6	L-shell
7	Geomagnetic latitude
8	Magnetic local time (sec)
9	Velocity (km/sec)
10	I_{14} (current for mass 14)
11	α_{14} (attack angle of current for amu 14; + into ram, - out of ram)
12	I_{16}
13	α_{16}
14	I_{18}
15	α_{18}
16	I_{28}
17	α_{28}
18	I_{30}
19	α_{30}
20	I_{32}
21	α_{32}
22	I_{34}
23	α_{34}
24	I_{40}
25	α_{40}

MSI Data Base - Data Records (Cont.)

26	I_{44}
27	α_4
28	N_{16}
29	N_{28}
30	N_{40}
31	N_{14}
32	N_T $(N_T + \Sigma N_i)$
33	ρ $(\rho = k\Sigma N_i M_i)$
34	Time (sit mode 70° into ram) (T_{+70})
35	Altitude
36	α at T_{+70}
37	I_{28+70}
38	N_{28+70}
39	Time (sit - ram) (T_R)
40	Alt at T_R
41	α at T_R
42	$I_{28\ ram}$
43	$N_{28\ ram}$
44	Time (sit mode - 70° out of ram) (T_{-70})
45	Alt at T_{-70}
46	α at T_{-70}
47	I_{28-70}
48	N_{28-70}
49	Vacant
50	Vacant

APPENDIX F

MSIV ION DATA BASE

MSIV Ion Data Base Header Record

0.1	Word Count (23)	
0.2	Group Count (1)	
1	Experiment (MSIV)	
2	Orbit Number	
3	Month of year of orbit	
4	Day of month of orbit	
5	Year (last 2 digits of 19xx)	
6	Start time of orbit (GMT-sec)	
7	End time of orbit (GMT-sec)	
8	Start time of vehicle in sun ($<0 \rightarrow$ N/A)	
9	End time of vehicle in sun ($<0 \rightarrow$ N/A)	
10	Start time of vehicle in shade ($<0 \rightarrow$ N/A)	
11	End time of vehicle in shade ($<0 \rightarrow$ N/A)	
12	GMT of perigee (sec)	
13	Altitude of perigee (km)	
14	Longitude (+E) of perigee	
15	Geodetic latitude of perigee	
16	Geomagnetic latitude of perigee	
17	Invariant latitude of perigee	
18	Local time of perigee	
19	Magnetic local time of perigee	
20	Corrected magnetic local time of perigee	
21	Commutator$_1$	
22	Commutator$_2$	
23	Commutator$_3$	from first 8 frames
24	Commutator$_4$	of data in pass
25	Commutator$_5$	
26	Commutator$_6$	
27	Commutator$_7$	
28	Commutator$_8$	

MSIV Ion Data Base Header Record (Cont.)

29	$Commutator_1$	
30	$Commutator_2$	
31	$Commutator_3$	
32	$Commutator_4$	From last 8 frames of data in pass
33	$Commutator_5$	
34	$Commutator_6$	
35	$Commutator_7$	
36	$Commutator_8$	
37	Vacant	
38	Vacant	

MSIV Ion Data Base Data Records

0.1	Word Count (39)
0.2	Group Count (13)
1	Time of start of selected frame (GMT seconds)
2	Altitude (km)
3	Geodetic latitude
4	Geomagnetic latitude
5	Invariant latitude
6	L-Shell
7	Longitude (+E)
8	Magnetic local time (sec)
9	Corrected magnetic local time (sec)
10	Local time (sec)
11	I_{14} (corrected to ram)
12	I_{16} (corrected to ram)
13	I_{28} (corrected to ram)
14	I_{30} (corrected to ram)
15	I_{32} (corrected to ram)
16	α_{14} at time of I_{14} (α = attack angle)
17	α_{16} at time of I_{16}
18	α_{28} at time of I_{28}
19	α_{30} at time of I_{30}
20	α_{32} at time of I_{32}
21	β_{14} at time of I_{14} (β = pitch angle)
22	β_{16} at time of I_{16}
23	β_{28} at time of I_{28}
24	β_{30} at time of I_{30}
25	β_{32} at time of I_{32}

MSIV Ion Data Base Data Records (Cont.)

26	ΣI_i (where I_i are corrected currents)
27	RA_1 (where RA has been translated to ram)
28	αRA_1
29	RA_2 (translated to ram)
30	αRA_2
31	RA_3 (translated to ram)
32	αRA_3
33	TI_1
34	TI_2
35	TI_3
36	TI_4
37	Beam $Monitor_1$
38	Beam $Monitor_2$
39	High Voltage Monitor

APPENDIX G

ION DENSITY GAUGE DATA BASE

Data Base Storage: Ion Density Gauge

Header Record

0.1	Word Count (35)
0.2	Group Count (1)
1	Orbit No.
2	Month of orbit
3	Day of orbit
4	Year of orbit (last two digits of 19xx)
5	K_p for orbit
6	$F_{10.7}$ cm flux for orbit
7	Start time of orbit (GMT sec)
8	End time of orbit (GMT sec)
9	Start time of vehicle in sun
10	End time of vehicle in sun
11	Start time of vehicle in shade
12	End time of vehicle in shade
13	Perigee time (GMT sec)
14	Perigee altitude (km)
15	Perigee longitude (+E)
16	Perigee latitude
17	Local time of perigee (sec)
18	Electronics temperature (average)
19	Gauge temperature (representative value)
20	TGE (calculated Tg)

Data Base Storage: Ion Density Gauge (Cont.)

21	a_0	Coefficients to least square fit for downleg
22	a_1	where
23	a_2	
24	a_3	$\log_\rho = \sum_{i=o}^{4} a_i z^i - 15$
25	a_4	ρ = density; z = altitude $z \leq 350$ km
26	b_0	Coefficients for up leg data fit
27	b_1	Coefficients for up leg data fit
28	b_2	
29	b_3	$\log\rho = \sum_{i=o}^{4} b_i z^i - 15$
30	b_4	$z \leq 350$ km
31	Gauge Number {value = 4 for -4, -6, value = 5 for -5, -7}	
32	Eccentricity	
33	Inclination	
34	$F_{10.7}$ flux (3 month average)	
35	Vacant	

Data Records - Ion Density Gauge Data Base

0.1	Word Count (21)
0.2	Group Count (24)
1	Time (ram) (GMT sec)
2	Altitude (km)
3	Longitude (+E)
4	Latitude (Geodetic)
5	Magnetic latitude
6	Local time (seconds)
7	I (current at 40° going into ram)
8	Pg (pressure at 40° going into ram)
9	R (S, D, α) (R factor at 40° going into ram)
10	I (current at 40° going out of ram)
11	Pg (pressure at 40° going out of ram)
12	R (S, D, α) (R factor at 40° out of ram)
13	Pressure into ram (from fit)
14	Pressure out of ram (from fit)
15	Average pressure (average of 13, 14 above)
16	Measured density ρ
17	Model density (J '71)
18	Model temperature (J '71)
19	Model pressure (J '71)
20	High Voltage
21	Vacant
	Words 1-21 repeat 23 times

APPENDIX H

MSIV NEUTRAL HIGH DATA BASE

MSIV Neutral High (NH)

Header Record

0.1	Word Count (38)
0.2	Group Count (1)
1	Experiment (MSIV - NH)
2	Orbit Number
3	Month of year of orbit
4	Day of month of orbit
5	Year (last two digits of 19xx)
6	Start time of orbit (GMT sec)
7	End time of orbit (GMT sec)
8	Start time of vehicle in sun (<0 = >N/A)
9	End time of vehicle in sun (<0 = >N/A)
10	Start time of vehilce in shade (<0 = >N/A)
11	End time of vehicle in shade (<0 = >N/A)
12	GMT of perigee (sec)
13	Altitude of perigee (km)
14	Longitude (+E) of perigee
15	Geodetic latitude of perigee
16	Geomagnetic latitude of perigee
17	Invariant latitude of perigee
18	Local time of perigee
19	Magnetic local time of perigee
20	Corrected magnetic local time of perigee

MSIV Neutral High (NH) (Cont.)

21	Commutator 1	
22	Commutator 2	
23	Commutator 3	
24	Commutator 4	From first 8 frames of data in the pass
25	Commutator 5	
26	Commutator 6	
27	Commutator 7	
28	Commutator 8	
29	Commutator 1	
30	Commutator 2	
31	Commutator 3	
32	Commutator 4	From last 8 frames of data in the pass
33	Commutator 5	
34	Commutator 6	
35	Commutator 7	
36	Commutator 8	
37	Vacant	

Data Records - MSIV Neutral High Data Base

0.1	Word Count (72)
0.2	Group Count) ($\leq$7)
1	GMT at point closest to ram (sec)
2	Altitude
3	Geodetic
4	Longitude (+E)
5	Invariant latitude
6	L-shell
7	Geomagnetic latitude
8	Magnetic local time
9	Corrected magnetic local time
10	Velocity (km/sec)
11	Pitch Angle
12	T_1 ram
13	T_1 ram
14	T_1 wake
15	I_1 wake
16	T_2 ram
17	I_2 ram
18	T_2 wake
19	I_2 wake
20	T_4 ram
21	I_4 ram
22	T_4 wake
23	I_4 wake
24	T_{14} ram
25	I_{14} ram
26	T_{14} wake
27	I_{14} wake
28	T_{16} ram
29	I_{16} ram
30	T_{16} wake
31	I_{16} wake

Data Records - MSIV Neutral High Data Base (Cont.)

32	T_{28} ram
33	I_{28} ram
34	T_{28} wake
35	I_{28} wake
36	T_{30} ram
37	I_{30} ram
38	T_{30} wake
39	I_{30} wake
40	T_{32} ram
41	I_{32} ram
42	T_{32} wake
43	I_{32} wake
44	T_{40} ram
45	I_{40} ram
46	T_{40} wake
47	I_{40} wake
48	T_{44} ram
49	I_{44} ram
50	T_{44} wake
51	I_{44} wake
52	α_1 of ram I_1 (+ = into ram; - = away from ram)
53	α_2 of ram I_2 (+ = into ram; - = away from ram)
54	α_4 of ram I_4 (+ = into ram; - = away from ram)
55	α_{14} of ram I_{14} (+ = into ram; - = away from ram)
56	α_{16} of ram I_{16} (+ = into ram; - = away from ram)
57	α_{28} of ram I_{28} (+ = into ram; - = away from ram)
58	α_{30} of ram I_{30} (+ = into ram; - = away from ram)
59	α_{32} of ram I_{32} (+ = into ram; - = away from ram)
60	α_{40} of ram I_{40} (+ = into ram; - = away from ram)
61	α_{44} of ram I_{44} (+ = into ram; - = away from ram)

Data Records - MSIV Neutral High Data Base (Cont.)

62	Ratio monitor 4
63	Ratio monitor 5
64	Ratio monitor 6
65	Ratio monitor 7
66	Ratio monitor 8
67	Beam monitor$_3$
68	Beam monitor$_4$
69	High Voltage Monitor
70	Vacant
71	Vacant
72	Vacant

APPENDIX I

S3-1 DATA BASE LIST (Sample)

S3-1 DATA BASE NOVEMBER 1974 03/02/78
COMPLETED REVS

REV		DATE	START TIME	STOP TIME	START TIME	STOP TIME	MESA CCTAPE/FILE	TOS CCTAPE/FILE	MSIV(TONS) CCTAPE/FILE	MSIV(NH) CCTAPE/FILE	MSI CCTAPE/FILE	KP
61	*	11/05/74	4191.	6690.	01:09:40	01:51:30	CC2252/185	CC2222/151	CC0001/195	CC0811/148	CC0229/082	1+
63	*	11/05/74	19239.	21358.	05:21:33	05:55:57	CC2252/184	CC2222/152	CC0001/196	CC0811/149	CC1067/028	1
65	*	11/05/74	34416.	36475.	09:33:35	10:07:54	CC2761/357	CC0244/156	CC0227/252	CC0112/038	CC0229/107	1
68	*	11/05/74	57034.	59150.	15:51:33	16:25:43	CC3232/156	CC0244/143	CC0227/101	CC0218/106	CC0229/241	1-
70	*	11/05/74	72130.	74246.	20:03:33	20:37:26	CC3345/261	CC2222/162	CC0001/197	CC0811/150	CC1067/029	2-
77	*	11/06/74	31076.	33131.	08:37:55	09:12:10	CC3228/383	CC2222/153	CC3225/086	CC1243/160	CC1067/019	2-
78	*	11/06/74	46171.	48227.	12:49:30	13:23:46	CC3228/382	CC2222/154	CC0001/198	CC0811/151	CC1067/020	3
80	*	11/06/74	61257.	63323.	17:01:06	17:35:22	CC2252/183	CC2222/155	CC0001/200	CC0811/153	CC1067/021	2+
81	*	11/06/74	68815.	70871.	19:06:54	19:41:10	CC3228/381	CC2222/156	CC0001/001	CC0226/140	CC0229/103	1-
83	*	11/06/74	83311.	85977.	23:18:30	23:52:56	CC3232/076	CC0244/172	CC0001/002	CC0226/141	CC0229/083	1+
85	*	11/07/74	12616.	14662.	03:30:05	04:04:21	CC3228/432	CC2222/158	CC0001/003	CC0226/142	CC1067/022	2+
87	*	11/07/74	27530.	29743.	07:41:30	08:15:42	CC3228/431	CC2222/157	CC0279/003	CC2291/120	CC1067/023	2
89	*	11/07/74	42750.	44812.	11:52:39	12:26:51	CC3228/430	CC2222/163	CC0279/005	CC2291/122	CC0229/240	1
91	*	11/07/74	57928.	59979.	16:03:47	16:37:58	CC3228/429	CC2222/159	CC0279/004	CC2291/121	CC1067/024	2+
93	*	11/07/74	72931.	74943.	20:14:50	20:49:02	CC3228/428	CC2222/160	CC0279/006	CC2291/123	CC1067/025	2+
95	*	11/08/74	1535.	3607.	00:25:54	01:00:06	CC3228/419	CC2222/161	CC0279/008	CC2291/125	CC0229/238	2+
97	*	11/08/74	16623.	18675.	04:37:02	05:11:15	CC2977/010	CC0244/155	CC0001/005	CC0226/144	CC1067/026	2-
99	*	11/08/74	31539.	33741.	08:48:08	09:22:20	CC2977/011	CC0244/201	CC1227/262	CC0112/106	CC1067/027	1
100	*	11/08/74	39358.	41274.	11:06:07	11:27:53	CC2977/012	CC0557/168	CC3225/087	CC0226/145	CC1067/001	1
101	*	11/08/74	46775.	48807.	12:59:14	13:33:26	CC2977/013	CC0557/169	CC0001/004	CC0226/143	CC1067/002	3
103	*	11/08/74	61321.	63873.	17:10:20	17:44:32	CC2977/014	CC0557/184	CC0001/008	CC0226/146	CC1067/003	3
105	*	11/08/74	76937.	78939.	21:21:26	21:55:38	CC2252/136	CC0557/190	CC0001/011	CC0226/149	CC0229/057	6-
107	*	11/09/74	5553.	7603.	01:32:32	02:06:42	CC3945/263	CC0244/192	CC0227/107	CC0218/112	CC0229/166	5+
108	*	11/09/74	13075.	15124.	03:37:54	04:12:03	CC2977/015	CC0557/186	CC0227/114	CC0218/119	CC0229/213	6-
109	*	11/09/74	20597.	22646.	05:43:16	06:17:25	CC3345/415	CC2222/164	CC1795/320	CC2080/143	CC0229/197	6-
110	*	11/09/74	28119.	30168.	07:48:38	08:22:47	CC2977/016	CC0557/185	CC0001/009	CC0226/147	CC0229/095	6-
111	*	11/09/74	35641.	37690.	09:54:00	10:28:09	CC2977/017	CC0557/187	CC3225/089	CC0226/148	CC0229/109	5-
112	*	11/09/74	43163.	45212.	11:59:22	12:33:31	CC3945/420	CC0244/160	CC1795/319	CC2080/147	CC0229/206	5-
113	*	11/09/74	50685.	52734.	14:04:45	14:38:53	CC2977/018	CC0557/191	CC3225/088	CC0226/150	CC1067/005	5-
114	*	11/09/74	58206.	60255.	16:10:05	16:44:15	CC3945/419	CC0244/159	CC0227/102	CC0218/107	CC0229/205	4
115	*	11/09/74	65316.	67778.	18:15:55	18:49:37	CC2977/019	CC0557/192	CC0001/013	CC0226/151	CC1067/006	2
116	*	11/09/74	73251.	75300.	20:20:50	20:54:00	CC2977/020	CC0557/196	CC0001/014	CC0226/152	CC1067/007	2
117	*	11/09/74	80773.	82822.	22:26:12	23:00:21	CC2977/021	CC0557/193	CC0227/257	CC0112/103	CC1067/008	2+
119	*	11/10/74	9416.	11465.	02:36:55	03:11:04	CC2977/022	CC0557/194	CC0227/123	CC0218/128	CC1067/009	2+
120	*	11/10/74	16338.	18937.	04:42:17	05:16:25	CC2977/023	CC0557/195	CC0227/124	CC0218/129	CC1067/010	3
122	*	11/10/74	31973.	34019.	08:52:52	09:26:58	CC2761/365	CC2222/167	CC0001/199	CC0811/152	CC0229/164	1
123	*	11/10/74	39494.	41530.	10:58:03	11:32:09	CC2977/024	CC0557/198	CC0227/081	CC0218/086	CC1067/011	1
124	*	11/10/74	46976.	49042.	13:03:15	13:37:21	CC2252/135	CC0557/197	CC1289/099	CC0226/001	CC0229/058	1
125	*	11/10/74	54508.	56554.	15:08:27	15:42:33	CC2252/134	CC0557/211	CC0227/082	CC0219/087	CC0229/059	2
127	*	11/10/74	65953.	77473.	19:19:22	20:24:32	CC2761/364	CC0244/158	CC0001/201	CC0811/154	CC0229/165	2
131	*	11/11/74	13180.	15226.	03:39:39	04:13:45	CC2977/025	CC2222/165	CC0227/258	CC0112/104	CC1067/012	3
133	*	11/11/74	28203.	30250.	07:50:02	08:24:09	CC2977/026	CC0557/199	CC0227/125	CC0219/130	CC1067/013	2
135	*	11/11/74	43227.	45273.	12:00:26	12:34:32	CC2977/027	CC0557/200	CC0227/126	CC0218/131	CC1067/014	5
137	*	11/11/74	58240.	60287.	16:10:39	16:44:42	CC2977/028	CC0557/201	CC0227/259	CC0112/105	CC1067/015	7
138	*	11/11/74	65740.	67783.	18:15:39	18:49:42	CC2252/139	CC0557/202	CC1795/229	CC1790/001	CC0520/001	6
139	*	11/11/74	73241.	75285.	20:20:40	20:54:45	CC2252/138	CC0557/203	CC1289/101	CC0226/003	CC0520/002	6
140	*	11/11/74	80742.	82786.	22:25:41	22:59:45	CC2977/029	CC0557/171	CC1289/100	CC0226/002	CC1067/016	6-
141	*	11/12/74	1944.	3387.	00:30:43	01:04:45	CC2977/030	CC0557/205	CC1289/102	CC0226/004	CC0229/239	6+
142	*	11/12/74	9714.	11388.	02:41:43	03:09:47	CC2977/031	CC0557/170	CC0001/016	CC0226/154	CC1067/017	6+
145	*	11/12/74	31949.	33892.	08:50:48	09:24:51	CC2977/032	CC0557/204	CC0001/017	CC0226/155	CC1067/018	5

ST-1 DATA BASE NOVEMBER 1974 03/02/78
COMPLETED REVS

REV		DATE	START TIME	STOP TIME	START TIME	STOP TIME	MESA CCTAPE/FILE	IDS CCTAPE/FILE	MSIV(IONS) CCTAPE/FILE	MSIV(NH) CCTAPE/FILE	MSI CCTAPE/FILE	KP
146	*	11/12/74	33350.	41393.	10:55:49	11:29:52	CC2977/033	CC0557/206	CC0227/127	CC0218/132	CC1067/030	5
147	*	11/12/74	46351.	48894.	13:00:50	13:34:53	CC2977/034	CC0557/207	CC0227/063	CC0218/088	CC1067/031	6-
148	*	11/12/74	54352.	56395.	15:05:51	15:39:54	CC2977/035	CC0557/206	CC0227 084	CC0218 089	CC0229/066	5+
149	*	11/12/74	61353.	63397.	17:10:52	17:44:56	CC2977/036	CC0557/209	CC0227/085	CC0218/090	CC1067/033	5+
153	*	11/13/74	5351.	7558.	01:39:20	02:05:57	CC2977/039	CC0557/210	CC1795/231	CC2080/062	CC0229/067	5-
154	*	11/13/74	12339.	15046.	03:35:38	04:10:45	CC2977/040	CC0557/172	CC1795/232	CC2060/063	CC1067/034	4
155	*	11/13/74	20334.	22534.	05:48:43	06:15:33	CC3945/414	CC0244/163	CC1795/322	CC2060/150	CC0229/207	4+
156	*	11/13/74	27315.	30022.	07:45:15	08:20:21	CC2977/041	CC0557/177	CC1795/230	CC2080/061	CC1067/035	4+
157	*	11/13/74	35432.	37516.	09:50:31	10:25:15	CC2977/042	CC0557/178	CC1795/233	CC2060/064	CC1067/036	5-
158	*	11/13/74	42930.	44998.	11:54:43	12:29:57	CC2977/043	CC2222/170	CC1795/234	CC2080/065	CC1067/037	4-
159	*	11/13/74	50378.	52486.	13:59:37	14:34:45	CC2977/044	CC2222/169	CC1795/287	CC2080/115	CC0229/111	4-
160	*	11/13/74	57356.	59374.	16:04:25	16:39:33	CC3345/418	CC0244/162	CC1795/288	CC2080/116	CC0229/172	5-
161	*	11/13/74	65375.	67461.	18:09:15	18:44:20	CC2977/045	CC0244/174	CC1795/236	CC2080/067	CC0229/084	5-
164	*	11/14/74	1418.	3526.	00:23:37	00:58:45	CC3223/069	CC2222/168	CC1795/240	CC2080/071	CC1067/038	6-
165	*	11/14/74	8306.	11014.	02:28:25	03:03:33	CC3223/087	CC2222/171	CC1795/239	CC2060/070	CC1067/039	6-
166	*	11/14/74	16334.	18502.	04:33:13	05:08:21	CC2252/137	CC2222/172	CC1795/238	CC2080/069	CC1067/040	6-
168	*	11/14/74	31370.	33478.	08:42:49	09:17:57	CC3226/086	CC2222/173	CC1795/244	CC2060/075	CC1067/041	4+
169	*	11/14/74	38858.	40966.	10:47:37	11:22:45	CC3223/085	CC2222/174	CC1795/243	CC2060/074	CC0229/096	4+
172	*	11/14/74	61322.	63430.	17:02:01	17:37:09	CC3226/084	CC2222/176	CC0001/202	CC0811/155	CC0229/170	5-
175	*	11/14/74	83753.	85866.	23:16:02	23:51:05	CC3232/107	CC0244/164	CC1795/245	CC2080/076	CC0229/175	1-
176	*	11/15/74	4837.	6941.	01:20:36	01:55:40	CC3228/093	CC2222/176	CC0227/108	CC0218/113	CC0229/035	1+
177	*	11/15/74	12318.	14415.	03:35:17	04:00:15	CC3945/413	CC0244/165	CC1795/241	CC2080/109	CC0229 201	1
184	*	11/15/74	64642.	66747.	17:57:21	18:32:26	CC3223/090	CC2222/180	CC0227/038	CC0218/093	CC0229/098	3-
185	*	11/15/74	72120.	74225.	20:01:00	20:37:04	CC3228/092	CC2222/182	CC3225/277	CC4327/076	CC0229/019	3-
186	*	11/15/74	79598.	81703.	22:06:37	22:41:42	CC3228/091	CC2222/181	CC3225/279	CC4327/078	CC0520/003	3-
188	*	11/16/74	9270.	10259.	02:17:49	02:50:58	CC2252/157	CC2222/183	CC3225/281	CC4327/080	CC0229/112	2
189	*	11/16/74	15632.	17737.	04:20:31	04:55:36	CC2252/156	CC2222/184	CC3225/278	CC4327/077	CC0229/117	4-
191	*	11/16/74	30578.	32679.	08:29:37	09:04:38	CC2252/188	CC2222/185	CC3225/092	CC1243/166	CC0229/099	4
193	*	11/16/74	45509.	47610.	12:38:28	13:13:30	CC2252/187	CC2222/186	CC3225/316	CC4327/115	CC0229/086	3+
194	*	11/16/74	53075.	55176.	14:42:54	15:17:55	CC2252/208	CC2222/189	CC1795/165	CC1790/002	CC1067/042	4-
195	*	11/16/74	60441.	62542.	16:47:20	17:22:21	CC3228/112	CC2222/187	CC3225/317	CC4327/116	CC0229/087	4-
196	*	11/16/74	67307.	71008.	18:51:46	19:26:47	CC3228/111	CC2222/188	CC3225/315	CC4327/114	CC0229/088	3+
197	*	11/16/74	75373.	77474.	20:56:12	21:31:13	CC3226/110	CC2222/190	CC3225/318	CC4327/117	CC0229/089	3-
198	*	11/16/74	82338.	84939.	23:00:37	23:35:35	CC3226/109	CC2222/191	CC3228/314	CC4327/113	CC0229/090	3-
199	*	11/17/74	3314.	6005.	01:05:13	01:40:04	CC3228/102	CC2222/246	CC3225/091	CC1243/165	CC1067/058	6-
201	*	11/17/74	18840.	20941.	05:13:00	05:48:00	CC3228/101	CC2222/192	CC3225/304	CC4327/103	CC1067/059	4-
203	*	11/17/74	33775.	35876.	09:22:54	09:57:55	CC2252/210	CC2222/193	CC3225/090	CC1243/164	CC0229/091	4-
204	*	11/17/74	41543.	43343.	11:32:22	12:02:22	CC3228/100	CC2222/195	CC3225/303	CC4327/102	CC0229/032	4-
205	*	11/17/74	48710.	50811.	13:31:48	14:06:50	CC3228/099	CC2222/196	CC3225/302	CC4327/101	CC0229/100	2+
206	*	11/17/74	56177.	58278.	15:36:16	16:11:17	CC2252/217	CC0244/168	CC1795/323	CC2080/151	CC0229/253	3
207	*	11/17/74	63828.	65746.	17:43:47	18:15:46	CC3226/107	CC2222/197	CC3225/306	CC4327/105	CC1067/060	3-
208	*	11/17/74	71112.	73213.	19:45:11	20:20:12	CC3228/106	CC2222/194	CC3225/305	CC4327/104	CC1067/061	3-
209	*	11/17/74	78579.	80680.	21:49:39	22:24:39	CC3228/108	CC2222/200	CC3225/319	CC4327/118	CC1067/043	3-
211	*	11/18/74	7115.	9213.	01:58:34	02:33:32	CC3228/117	CC2222/201	CC3225/093	CC1243/167	CC1067/044	3
213	*	11/18/74	22026.	24124.	06:07:05	06:42:03	CC3228/116	CC2222/202	CC3225/321	CC4327/120	CC1067/045	3-
215	*	11/18/74	36336.	39034.	10:15:35	10:50:33	CC3226/115	CC2222/199	CC3225/094	CC0226/156	CC1067/046	2+
216	*	11/18/74	44391.	46489.	12:19:50	12:54:48	CC3228/114	CC2222/198	CC3225/322	CC4327/121	CC1067/047	2+
218	*	11/18/74	59312.	61400.	16:28:31	17:03:19	CC3223/113	CC2222/203	CC3225/325	CC4327/124	CC1067/049	2
219	*	11/18/74	66756.	68854.	18:32:35	19:07:33	CC2252/218	CC0244/202	CC3225/308	CC4327/107	CC0229/101	3-
220	*	11/18/74	74212.	76310.	20:36:51	21:11:49	CC3228/105	CC0244/185	CC3225/307	CC4327/106	CC0229/102	1-

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COMPLETED REVS

			START	STOP	START	STOP	MESA	IDS	MSIV(IONS)	MSIV(NH)	MSI	
REV		DATE	TIME	TIME	TIME	TIME	CCTAPE/FILE	CCTAPE/FILE	CCTAPE/FILE	CCTAPE/FILE	CCTAPE/FILE	KP
221	*	11/18/74	81557.	83762.	22:41:06	23:16:01	CC3228/104	CC2222/204	CC3225/309	CC4327/108	CC1067/062	1-
223	*	11/19/74	10178.	12276.	02:49:37	03:24:35	CC3228/103	CC2222/206	CC3225/312	CC4327/111	CC0229/103	4-
228	*	11/19/74	47447.	49543.	13:10:45	13:45:40	CC2252/139	CC2222/205	CC3225/311	CC4327/110	CC0229/104	2+
230	*	11/19/74	62340.	64435.	17:18:00	17:53:54	CC2252/155	CC0244/167	CC3225/280	CC4327/079	CC0520/004	4-
231	*	11/19/74	69786.	71881.	19:23:35	19:58:00	CC2252/154	CC2222/209	CC3225/234	CC4327/083	CC0520/005	3-
232	*	11/19/74	77230.	79325.	21:27:03	22:02:04	CC2252/158	CC0244/189	CC1795/247	CC2080/078	CC0229/032	4-
235	*	11/20/74	13158.	15264.	03:39:27	04:14:23	CC3228/123	CC0244/190	CC3225/283	CC4327/082	CC0520/006	4-
239	*	11/20/74	43505.	45092.	12:05:14	12:31:31	CC3228/140	CC0557/214	CC3225/370	CC4327/129	CC0229/001	4+
240	*	11/20/74	50439.	52533.	14:00:38	14:35:32	CC3228/139	CC0557/215	CC3225/296	CC4327/095	CC0229/002	4+
241	*	11/20/74	57831.	53975.	16:04:40	16:39:34	CC3228/138	CC0557/213	CC3225/297	CC4327/096	CC0229/003	4-
242	*	11/20/74	65322.	67416.	18:08:41	18:43:35	CC3232/155	CC4353/418	CC0227/100	CC0218/105	CC0229/244	4+
243	*	11/20/74	72754.	74858.	20:12:43	20:47:37	CC3232/154	CC0244/166	CC0227/105	CC0218/110	CC0229/245	4+
244	*	11/20/74	80205.	82299.	22:16:45	22:51:38	CC3228/137	CC0244/169	CC3225/298	CC4327/097	CC0229/004	2-
245	*	11/21/74	1247.	3341.	00:20:46	00:55:40	CC3228/145	CC0244/027	CC3225/299	CC4327/098	CC0229/005	2
246	*	11/21/74	9112.	10783.	02:31:51	02:59:42	CC3228/144	CC0557/217	CC3225/300	CC4327/099	CC0229/006	2
247	*	11/21/74	16170.	18225.	04:28:49	05:03:45	CC3228/143	CC0557/218	CC3225/301	CC4327/100	CC0229/007	4-
248	*	11/21/74	23572.	25666.	06:32:51	07:07:45	CC3228/142	CC0557/216	CC0227/253	CC0112/099	CC0229/008	4
249	*	11/21/74	31024.	33108.	08:37:03	09:11:47	CC3228/136	CC0557/219	CC3225/337	CC1243/171	CC0520/007	5
250	*	11/21/74	38454.	40549.	10:40:53	11:15:48	CC3228/135	CC0557/220	CC3225/329	CC4327/128	CC0229/253	5
251	*	11/21/74	45837.	47990.	12:44:55	13:19:49	CC3228/119	CC0557/223	CC3225/324	CC4327/123	CC0229/110	3+
252	*	11/21/74	53338.	55432.	14:48:57	15:23:51	CC3228/337	CC0557/225	CC3225/326	CC4327/125	CC1067/051	4+
254	*	11/21/74	68211.	70302.	18:56:50	19:31:41	CC3228/118	CC0557/224	CC1795/166	CC1790/003	CC0229/114	3+
255	*	11/21/74	75544.	77735.	21:00:43	21:35:34	CC3232/158	CC0244/167	CC0227/106	CC0218/111	CC0229/247	4-
256	*	11/21/74	83077.	85168.	23:04:35	23:39:27	CC3232/157	CC0244/138	CC0227/109	CC0218/114	CC0229/246	4-
258	*	11/22/74	11543.	13634.	03:12:22	03:47:13	CC3945/422	CC0244/001	CC0227/089	CC0218/094	CC0229/208	4-
260	*	11/22/74	26411.	28503.	07:20:10	07:55:02	CC2252/143	CC0557/222	CC1795/167	CC1790/004	CC0229/152	4
261	*	11/22/74	33844.	35936.	09:24:03	09:58:55	CC2252/142	CC0557/221	CC3225/098	CC1243/172	CC0229/153	4-
262	*	11/22/74	41716.	43369.	11:35:15	12:02:48	CC3228/148	CC0557/229	CC1795/169	CC1790/006	CC0520/008	4-
263	*	11/22/74	48710.	50802.	13:31:43	14:06:41	CC3228/131	CC0557/230	CC3225/287	CC4327/086	CC0520/009	3+
264	*	11/22/74	56143.	58235.	15:35:42	16:10:34	CC3228/130	CC0557/228	CC3225/294	CC4327/093	CC0520/010	4-
265	*	11/22/74	63576.	65668.	17:39:35	18:14:27	CC2761/359	CC0557/226	CC1795/277	CC2080/105	CC0229/060	3+
266	*	11/22/74	71009.	73101.	19:43:28	20:18:20	CC2252/128	CC0557/227	CC1795/279	CC2080/107	CC0229/215	3+
267	*	11/22/74	78442.	80534.	21:47:21	22:22:13	CC3945/426	CC0244/002	CC1795/232	CC2080/110	CC0229/173	3-
269	*	11/23/74	7379.	8399.	02:07:59	02:29:58	CC2252/211	CC0557/232	CC1795/171	CC2080/002	CC1067/052	3
271	*	11/23/74	22413.	23845.	06:13:22	06:37:24	CC3228/125	CC0557/231	CC1795/173	CC2080/005	CC1067/054	4
272	*	11/23/74	29179.	31268.	08:06:18	08:41:07	CC3228/146	CC0557/233	CC1795/174	CC2080/006	CC1067/055	4
273	*	11/23/74	36320.	38691.	10:15:13	10:44:50	CC3228/124	CC0557/234	CC1795/175	CC2080/003	CC1067/056	4-
274	*	11/23/74	44025.	46114.	12:13:45	12:48:33	CC2252/207	CC2222/212	CC0227/030	CC0218/095	CC0229/041	4+
276	*	11/23/74	58871.	60960.	16:21:10	16:55:00	CC2252/206	CC2222/249	CC0227/110	CC0218/115	CC0229/042	4-
277	*	11/23/74	66234.	68383.	18:24:33	18:59:42	CC2252/205	CC2222/250	CC0227/255	CC0112/101	CC0229/043	3+
279	*	11/23/74	81140.	83229.	22:32:19	23:07:06	CC3228/120	CC0557/236	CC1795/176	CC2080/007	CC0229/214	4-
281	*	11/24/74	9586.	11675.	02:39:45	03:14:34	CC2252/204	CC2222/214	CC0227/096	CC0218/101	CC0229/038	5
282	*	11/24/74	17038.	19098.	04:43:27	05:18:17	CC2252/203	CC2222/215	CC0227/119	CC0218/124	CC0229/044	5
283	*	11/24/74	24443.	26522.	06:47:22	07:22:01	CC2252/141	CC0557/235	CC1795/177	CC2080/008	CC0229/154	3-
284	*	11/24/74	31356.	33945.	08:50:55	09:25:45	CC2252/140	CC0557/237	CC1795/178	CC2080/009	CC0229/155	4-
285	*	11/24/74	39338.	41368.	11:03:57	11:29:27	CC3945/424	CC0244/003	CC1795/324	CC2080/152	CC0229/211	4-
286	*	11/24/74	45712.	48791.	12:58:21	13:33:10	CC3228/097	CC0557/244	CC1795/325	CC2080/153	CC0229/151	3+
287	*	11/24/74	54125.	56214.	15:02:04	15:36:57	CC3945/423	CC0244/004	CC1795/326	CC2080/154	CC0229/210	5+
289	*	11/24/74	61552.	63636.	17:05:51	17:40:35	CC3228/096	CC0557/243	CC0227/261	CC0112/107	CC1067/063	5+
290	*	11/24/74	76352.	78468.	21:13:01	21:47:47	CC3228/094	CC0557/179	CC1795/327	CC2080/155	CC0229/219	6

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REV	DATE	START TIME	STOP TIME	START TIME	STOP TIME	MFSA CCTAPE/FILE	IDG CCTAPE/FILE	MSIV(TONS) CCTAPE/FILE	MSIV(NH) CCTAPE/FILE	MSI CCTAPE/FILE	KP
292 *	11/25/74	4317.	6893.	01:20:06	01:54:52	CC3228/098	CC0557/241	CC1795/328	CC2080/156	CC0229/220	4+
293 *	11/25/74	12220.	14306.	03:23:33	03:58:25	CC2252/127	CC0557/248	CC1795/179	CC2080/010	CC0229/061	5
294 *	11/25/74	19532.	21718.	05:27:11	06:01:57	CC2252/126	CC0557/247	CC1795/189	CC2080/011	CC0229/062	5
295 *	11/25/74	27044.	29130.	07:30:43	08:05:30	CC2252/125	CC0557/245	CC1795/183	CC2080/014	CC0229/063	4
297 *	11/25/74	42314.	47356.	11:45:03	12:12:35	CC3228/134	CC0557/139	CC0227/118	CC0218/123	CC0229/009	2+
298 *	11/25/74	49233.	51369.	13:41:22	14:15:08	CC3228/133	CC0557/188	CC1795/182	CC2080/013	CC0229/010	2+
299 *	11/25/74	56535.	58781.	15:44:54	16:19:40	CC3228/132	CC0244/191	CC3225/328	CC4327/127	CC0229/011	4-
300 *	11/25/74	64107.	66193.	17:48:26	18:23:12	CC3228/141	CC0557/246	CC3225/295	CC4327/094	CC0229/012	4+
301 *	11/25/74	71519.	73605.	19:51:53	20:26:45	CC3228/121	CC0557/121	CC3225/286	CC4327/085	CC0520/011	4+
302 *	11/25/74	78931.	81017.	21:55:30	22:30:16	CC3228/126	CC0557/249	CC3225/235	CC4327/084	CC0520/012	4-
304 *	11/26/74	7357.	9433.	02:02:36	02:37:12	CC2761/360	CC0557/120	CC1795/151	CC2080/012	CC0229/013	3
305 *	11/26/74	14770.	16856.	04:06:03	04:40:55	CC2252/159	CC0557/119	CC1795/155	CC2080/016	CC0229/256	3-
308 *	11/26/74	35936.	38079.	10:16:35	10:51:18	CC2252/148	CC0557/250	CC1795/154	CC2080/015	CC0229/156	2+
309 *	11/26/74	44633.	46480.	12:24:52	12:54:39	CC2252/153	CC0557/122	CC0227/093	CC0218/098	CC0229/039	4+
310 *	11/26/74	51739.	53882.	14:23:15	14:58:01	CC2252/152	CC0557/124	CC0227/007	CC0218/008	CC0229/040	4+
311 *	11/26/74	59230.	61283.	16:26:33	17:01:22	CC2252/151	CC0557/123	CC0227/094	CC0218/102	CC0229/046	4+
312 *	11/26/74	66854.	68584.	18:34:13	19:04:43	CC3228/150	CC0557/251	CC3225/100	CC1243/174	CC0520/013	3+
313 *	11/26/74	74013.	76086.	20:33:22	21:08:05	CC3228/149	CC0557/252	CC3225/289	CC4327/088	CC0520/014	3+
315 *	11/27/74	2435.	4488.	00:40:04	01:14:47	CC2252/150	CC0244/175	CC0227/092	CC0218/037	CC0229/056	3
317 *	11/27/74	17218.	19291.	04:46:47	05:21:30	CC2252/147	CC0557/255	CC1795/186	CC2080/017	CC0229/070	3-
318 *	11/27/74	24619.	26692.	06:50:08	07:24:51	CC3945/421	CC0244/180	CC1795/249	CC2080/030	CC0229/157	3-
320 *	11/27/74	39379.	41495.	11:04:33	11:31:34	CC3228/129	CC0557/181	CC3225/291	CC4327/090	CC0520/015	2+
321 *	11/27/74	46813.	48896.	13:00:12	13:34:55	CC3228/128	CC0557/182	CC3225/292	CC4327/091	CC0520/016	2+
322 *	11/27/74	54214.	56297.	15:03:33	15:38:16	CC3228/127	CC0557/183	CC3225/293	CC4327/092	CC0520/017	2
323 *	11/27/74	61958.	63698.	17:12:47	17:41:37	CC3945/442	CC0244/178	CC1795/254	CC2080/084	CC0229/158	2
325 *	11/27/74	76418.	78501.	21:13:37	21:48:20	CC3232/152	CC0244/181	CC0227/120	CC0218/125	CC0229/242	4-
326 *	11/27/74	83319.	85302.	23:16:33	23:51:41	CC3232/163	CC0244/182	CC0227/115	CC0218/120	CC0229/255	4-
327 *	11/28/74	4321.	6904.	01:20:20	01:55:03	CC3945/441	CC0244/005	CC1795/251	CC2080/082	CC0229/159	2
328 *	11/28/74	12223.	14306.	03:23:42	03:58:25	CC3232/162	CC0244/194	CC0227/112	CC0218/117	CC0229/248	3-
329 *	11/28/74	20035.	21705.	05:34:54	06:01:45	CC3232/161	CC0244/179	CC0227/111	CC0218/116	CC0229/243	3-
330 *	11/28/74	27316.	29396.	07:30:15	08:04:55	CC2761/419	CC0244/006	CC1795/283	CC2080/111	CC0229/174	3-
331 *	11/28/74	34417.	36487.	09:33:25	10:08:05	CC2761/418	CC0244/007	CC1795/370	CC2080/158	CC0229/250	1
334 *	11/28/74	56579.	58659.	15:42:58	16:17:38	CC2761/421	CC0244/009	CC1795/252	CC2080/083	CC0229/160	0
335 *	11/28/74	64030.	66049.	17:47:13	18:20:48	CC2761/426	CC0244/028	CC1795/285	CC2080/113	CC0229/176	1-
336 *	11/28/74	71350.	73440.	19:49:19	20:23:00	CC2761/425	CC0244/011	CC1795/331	CC2080/159	CC0229/179	1-
337 *	11/28/74	78731.	80831.	21:52:30	22:27:10	CC2761/424	CC0244/010	CC1795/329	CC2080/157	CC0229/203	1-
341 *	11/29/74	21344.	23934.	06:05:43	06:39:53	CC2761/430	CC0244/013	CC1795/284	CC2080/112	CC0229/178	1+
342 *	11/29/74	29315.	31385.	08:08:24	08:43:04	CC3232/164	CC0244/014	CC1795/236	CC2080/114	CC0229/217	1+
344 *	11/29/74	44318.	46166.	12:18:37	12:49:25	CC2252/216	CC0244/197	CC0227/116	CC0218/121	CC0229/048	0
345 *	11/29/74	51477.	53557.	14:17:55	14:52:36	CC2252/215	CC2222/217	CC0227/005	CC0218/104	CC0229/049	0
346 *	11/29/74	58958.	60348.	16:21:37	16:55:47	CC2252/213	CC2222/216	CC0227/095	CC0218/100	CC0229/116	1
347 *	11/29/74	66251.	68340.	18:24:20	18:59:00	CC3232/160	CC0244/173	CC0227/121	CC0218/125	CC0229/251	0
348 *	11/29/74	73652.	75732.	20:27:31	21:02:11	CC2761/429	CC0244/015	CC1795/332	CC2080/160	CC0229/215	0
349 *	11/29/74	81042.	83122.	22:30:41	23:05:21	CC2252/149	CC0244/016	CC1795/333	CC2080/161	CC0229/218	0
350 *	11/30/74	2025.	4132.	00:33:45	01:08:21	CC2761/420	CC0244/171	CC1795/256	CC2080/087	CC0229/161	0
355 *	11/30/74	39472.	41006.	10:57:51	11:23:25	CC2252/214	CC0557/117	CC0227/096	CC0218/011	CC0229/051	0
356 *	11/30/74	46319.	48386.	12:51:49	13:26:25	CC2252/212	CC0244/018	CC0227/008	CC0218/013	CC0229/052	0
357 *	11/30/74	53630.	55767.	14:54:49	15:29:26	CC2252/160	CC0557/239	CC1795/188	CC2080/019	CC0229/065	0
358 *	11/30/74	61071.	63148.	16:57:50	17:32:27	CC2252/145	CC0557/240	CC1795/187	CC2080/018	CC0229/094	0
359 *	11/30/74	68451.	70528.	19:00:50	19:35:27	CC2252/144	CC0557/118	CC3225/101	CC1243/175	CC0229/072	0

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S3-1 DATA BASE DECEMBER 1974 03/02/78
COMPLETED REVS

REV		DATE	START TIME	STOP TIME	START TIME	STOP TIME	MSSA CCTAPE/FILE	TOS CCTAPE/FILE	MSIV(IONS) CCTAPE/FILE	MSIV(NH) CCTAPE/FILE	MSI CCTAPE/FILE	KP
363	*	12/01/74	11575.	13652.	03:12:54	03:47:31	CC2252/178	CC2222/210	CC0227/075	CC0218/080	CC0229/037	0+
364	*	12/01/74	18956.	21033.	05:15:55	05:50:32	CC2252/091	CC0557/050	CC1795/257	CC2080/088	CC0229/054	0+
365	*	12/01/74	26337.	28414.	07:18:55	07:53:33	CC2252/094	CC0557/051	CC1795/002	CC0112/129	CC0229/055	0+
366	*	12/01/74	33717.	35794.	09:21:55	09:56:33	CC2252/098	CC0557/049	CC1795/318	CC2080/146	CC0229/073	1
367	*	12/01/74	41098.	43175.	11:24:57	11:59:34	CC2252/037	CC0557/003	CC1795/003	CC2080/020	CC0229/074	1
368	*	12/01/74	48479.	50556.	13:27:56	14:02:35	CC2252/096	CC0557/002	CC1795/004	CC2080/023	CC0229/077	1
369	*	12/01/74	55359.	57936.	15:30:53	16:05:35	CC3945/439	CC0244/207	CC0227/284	CC0112/130	CC0229/195	2-
376	*	12/02/74	21055.	23130.	05:50:54	06:25:30	CC3232/170	CC4353/427	CC0227/279	CC0112/125	CC0229/235	3-
377	*	12/02/74	28427.	30502.	07:53:45	08:28:21	CC3232/169	CC0244/209	CC0227/153	CC0218/158	CC0229/236	3-
380	*	12/02/74	50542.	52617.	14:02:21	14:36:56	CC3228/346	CC0557/001	CC1795/006	CC0218/159	CC0229/078	2+
382	*	12/02/74	65450.	67360.	18:10:00	18:42:39	CC2252/101	CC2222/460	CC1795/104	CC2080/025	CC0229/080	3
384	*	12/02/74	80029.	82107.	22:13:43	22:48:22	CC3945/436	CC0244/210	CC1795/316	CC2080/144	CC0229/196	2+
388	*	12/03/74	23090.	25169.	06:24:57	06:59:28	CC2252/100	CC2222/461	CC1795/009	CC1790/016	CC0229/075	2+
389	*	12/03/74	30459.	32530.	08:27:38	09:02:09	CC2761/384	CC2222/436	CC0279/190	CC0196/092	CC0229/224	2+
390	*	12/03/74	37820.	39891.	10:30:13	11:04:50	CC3945/446	CC2222/435	CC0279/101	CC0196/093	CC0229/226	3-
391	*	12/03/74	45954.	47253.	12:44:13	13:07:32	CC3945/239	CC0557/006	CC0227/177	CC0218/142	CC0229/122	3-
392	*	12/03/74	52542.	54614.	14:35:41	15:10:13	CC3945/233	CC0557/008	CC1795/014	CC1790/021	CC0229/020	3-
393	*	12/03/74	59313.	61975.	16:38:22	17:12:54	CC3945/234	CC0557/009	CC1795/011	CC1790/018	CC0229/021	2
394	*	12/03/74	67254.	69336.	18:41:03	19:15:35	CC2252/165	CC0557/012	CC1795/306	CC2080/134	CC0229/022	4+
395	*	12/03/74	74625.	76597.	20:43:45	21:18:15	CC3945/445	CC2222/514	CC1795/307	CC2080/135	CC0229/228	3+
396	*	12/03/74	81937.	84058.	22:46:26	23:20:57	CC2252/099	CC0557/014	CC1795/193	CC2080/024	CC0229/081	3+
400	*	12/04/74	25012.	27104.	06:57:11	07:31:43	CC3945/236	CC0557/011	CC1795/010	CC1790/017	CC0229/024	3-
416	*	12/05/74	56305.	58376.	15:38:24	16:12:55	CC3945/241	CC2222/508	CC1795/300	CC2080/128	CC0229/202	2+
418	*	12/05/74	70974.	73041.	19:42:53	20:17:20	CC3228/372	CC0557/016	CC1795/018	CC1790/025	CC0229/026	3
423	*	12/06/74	21316.	23373.	05:55:05	06:29:32	CC2761/050	CC0557/017	CC1795/020	CC1790/027	CC0229/127	1-
427	*	12/06/74	50637.	52760.	14:04:52	14:39:19	CC2761/058	CC0557/020	CC1795/023	CC1790/030	CC0229/129	1
429	*	12/06/74	65337.	67454.	18:09:46	18:44:13	CC2761/065	CC0557/021	CC1795/024	CC1790/031	CC0229/130	0+
431	*	12/06/74	80080.	82148.	22:14:39	22:49:07	CC2761/057	CC2222/459	CC1795/021	CC1790/028	CC0229/131	1-
433	*	12/07/74	4875.	12207.	01:21:15	03:23:26	CC2761/064	CC0557/047	CC1795/258	CC2080/089	CC0229/132	2-
435	*	12/07/74	23025.	25089.	06:23:45	06:58:08	CC2761/063	CC0557/048	CC1795/026	CC1790/033	CC0229/139	2-
437	*	12/07/74	37534.	39758.	10:28:13	11:02:37	CC2761/068	CC2222/223	CC1795/195	CC2080/026	CC0229/265	2+
441	*	12/07/74	67033.	69097.	18:37:12	19:11:36	CC3945/246	CC2222/509	CC1795/301	CC2080/129	CC0229/181	2-
443	*	12/07/74	81702.	83766.	22:41:41	23:15:05	CC3945/245	CC2222/510	CC1795/303	CC2080/131	CC0229/140	2
445	*	12/08/74	9970.	12034.	02:46:09	03:20:33	CC3945/244	CC2222/502	CC1795/219	CC2080/117	CC0229/180	2
451	*	12/08/74	53979.	56043.	14:59:38	15:34:02	CC3945/251	CC2222/501	CC1795/292	CC2080/120	CC0229/230	3+
457	*	12/09/74	11544.	13605.	03:12:23	03:46:45	CC3945/250	CC2222/515	CC1795/309	CC2080/137	CC0229/189	5
459	*	12/09/74	26134.	28256.	07:16:33	07:50:55	CC3945/249	CC2222/516	CC1795/310	CC2080/138	CC0229/190	4
461	*	12/09/74	40945.	42906.	11:20:45	11:55:05	CC3945/248	CC2222/518	CC1795/312	CC2080/140	CC0229/191	5
463	*	12/09/74	55495.	57556.	15:24:54	15:59:15	CC3945/247	CC2222/519	CC1795/313	CC2080/141	CC0229/183	5+
470	*	12/10/74	20333.	22391.	05:39:52	06:13:10	CC3945/412	CC2222/235	CC0279/151	CC0196/055	CC0229/162	4-
471	*	12/10/74	27547.	29705.	07:39:06	08:15:04	CC3945/411	CC2222/234	CC0279/152	CC0196/056	CC0229/163	4-
472	*	12/10/74	34351.	37019.	09:42:40	10:16:58	CC2761/062	CC2222/503	CC1795/207	CC2080/121	CC0229/222	2+
474	*	12/10/74	49539.	51647.	13:46:28	14:20:45	CC3945/410	CC0557/054	CC1795/070	CC1790/037	CC0229/134	3+
475	*	12/10/74	56303.	58961.	15:45:22	16:27:40	CC3232/004	CC2222/500	CC1795/240	CC2080/118	CC0229/184	4-
476	*	12/10/74	64217.	66275.	17:50:16	18:24:34	CC3232/003	CC2222/499	CC1795/291	CC2080/119	CC0229/185	3
477	*	12/10/74	71531.	73589.	19:52:10	20:26:26	CC3945/409	CC0557/053	CC0279/157	CC0196/051	CC0229/135	3
478	*	12/10/74	78845.	80904.	21:54:04	22:28:27	CC3232/002	CC2222/513	CC1795/308	CC2080/136	CC0229/186	3-
481	*	12/11/74	14330.	16448.	03:59:49	04:34:07	CC3228/323	CC0557/056	CC1795/071	CC1790/036	CC0229/014	4-
482	*	12/11/74	21537.	23752.	06:01:36	06:35:51	CC3945/232	CC0557/055	CC1795/072	CC1790/039	CC0229/136	3+
484	*	12/11/74	36311.	38355.	10:05:00	10:39:15	CC3232/006	CC0244/213	CC0227/148	CC0218/153	CC0229/229	4